1103

AIRLINER CABIN AIR QUALITY

HEARING

BEFORE THE

SUBCOMMITTEE ON AVIATION

OF THE

COMMITTEE ON

PUBLIC WORKS AND TRANSPORTATION

HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRD CONGRESS

SECOND SESSION

MAY 18, 1994

Printed for the use of the
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CONTENTS

SUBMISSIONS FOR THE RECORD

ADDITIONS TO THE RECORD

U.S. House of Representatives

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

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WASHINGTON, DC 20515
(202) 225-4472

M E M O R A N D U M

TO: Members of the Subcommittee on Aviation

FROM: Committee's Aviation Staff

DATE: May 16, 1994

RE: **SUMMARY OF SUBJECT MATTER** for the hearing on **AIR LINER CABIN AIR QUALITY,** Wednesday, May 18, 1994, at 9:30 a.m.

Efforts to improve airliner cabin air quality for the benefit of passengers and crew go back over a decade, and include legislation, rules, studies, three hearings by this subcommittee (including today's), and citizen and flight attendant activism. The effort focused initially on smoking, culminating in the ban on smoking on all domestic flights of six hours or less. With the air somewhat cleared, concern has turned to the broader universe of contaminants, including the use of pesticides in airplanes with passengers and crew aboard (required by certain foreign countries), and the continued infliction of second-hand smoke on flight attendants on international flights.

Despite findings of various studies that airliner cabin air is generally safe for healthy people, complaints from flight attendants who spend their working lives in this environment; concerns for the transmission of disease, including tuberculosis,

in this as in other small, confined and densely populated areas; and conviction by many passengers that they suffer respiratory and other problems after prolonged flight, continue to be voiced.

Today's hearing will concentrate on the overall quality of air in the cabin; on the technology and practices to ensure healthful air; on the health effects of smoking on international flights; and on the use of pesticides on occupied aircraft.

BACKGROUND

The quality of air in the airliner cabin has until recently been inextricably bound to the issue of smoking on aircraft.

The Federal Government first regulated smoking on commercial aircraft in 1973, when it promulgated regulations separating smokers from nonsmokers, and required that all commercial flights provide non-smoking sections large enough to accommodate every non-smoker.

In 1979, airlines were further required to specifically segregate cigar and pipe smokers, ban smoking when the aircraft ventilation system was not functioning properly, ensure that non-smokers were not unreasonably burdened when sandwiched between two smoking sections, and guarantee seating to non-smokers in non-smoking sections.

In 1984, the now-sunset Civil Aeronautics Board (CAB) issued revised rules that prohibited smoking on airline aircraft under 30 seats, cigar and pipe smoking on all flights, and smoking when the aircraft was on the ground.

During the 1984 rule review, the CAB considered and rejected a proposal to ban smoking on short flights because it found health and safety reasons did not justify such a ban, ad because it found the administrative and practical problems of enforcing a short-term smoking ban and the resulting confusion outweighed the additional comfort provided to non-smokers by a short-term smoking ban.

Public Law 98-466, enacted in October, 1984, required the Secretary of Transportation to commission an independent study by the National Academy of Sciences (NAS) to determine whether the requirements governing airline cabin air were comparable to non-aviation requirements, and adequate to maintain public and occupational health for passengers and crew.

The Act also required Department of Transportation (DOT) to submit the report, along with its own comments and recommendations, to Congress. DOT's instructions to NAS covered a number of cabin air conditions and pollutants, including tobacco smoke. NAS was then tasked to recommend remedies for problems discovered.

The Report, "The Airliner Cabin Environment: Air Quality and

Safety," was presented to DOT in August, 1986. The Report found that:

> " . . . if the lowest rate of ventilation permitted by current equipment design were used under conditions of full or nearly full passenger loads, the resulting ventilation rate would be at the minimum determined to provide acceptable air quality when smoking is not permitted and other contaminant sources are not present. In the absence of sources of contamination, this rate does not constitute a health hazard."

The Report made 21 recommendations, including a ban on smoking on all domestic commercial flights. In February, 1987, DOT submitted its follow-up "Report to Congress on Airline Cabin Air Quality." That Report recommended a further study, which was undertaken in April, 1989, and presented to Congress in December, 1989.

The DOT Report, "Airliner Cabin Environment: Contaminant Measurements, Health Risks, and Mitigation Options," was tasked to develop information to be used for determining health risks from exposure to Environmental Tobacco Smoke (ETS) and other pollutants for airliner occupants. Selected ETS contaminants, carbon monoxide, ozone, microbial aerosols, carbon dioxide and other environmental variables were measured on 92 randomly selected smoking and non-smoking flights.

The study concluded that:

- Levels of Environmental Tobacco Smoke were highest in the smoking sections;
- Carbon dioxide levels were frequently above the level recommended by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) to satisfy comfort (odor) criteria;
- Relative humidity levels on monitored flights were quite low, averaging near 15% on smoking flights and near 20% on non-smoking flights;
- Average levels of other pollutants (ozone, carbon monoxide, bacteria, and fungi) were relatively low on virtually all monitored flights.

The Report's recommendations included that "Consideration should be given to a total ban on smoking on all flights . . . as a means of eliminating the ETS risks currently faced by non-smoking passengers and non-smoking cabin crew members."

It also recommended that the airlines take further mitigation measures against cosmic rays and carbon dioxide (CO2) and found that "No actions need to be taken to reduce currently prevailing levels of ozone or biological aerosols."

More recently two other studies have been conducted, one by the Air Transport Association, the airlines' trade association, and one by the ABC network for a 20/20 program which aired last Friday

night. Participants in both studies will testify at the hearing.

The Subcommittee on Aviation held hearings on smoking on airliners in October, 1987 and June, 1989.

In December, 1987, Public Law 100-202 banned smoking on all domestic flights of 2 hours or less duration, for the 2-year period 1988 to 1990. The current ban on smoking on all domestic flights of 6 hours or less took effect in 1990 (P.L. 101-164).

Smoking is still permitted in the passenger cabin of U.S. airlines on international flights. Individual airlines have established their own policies for smoking in the cockpit.

ISSUES

While the majority of flyers are healthy passengers, evaluation of air quality must consider as well the flight attendants who spend their working lives in the cabin, and passengers who are ill, possibly suffering from immuno-compromised diseases, and those allergic or hypersensitive to certain substances.

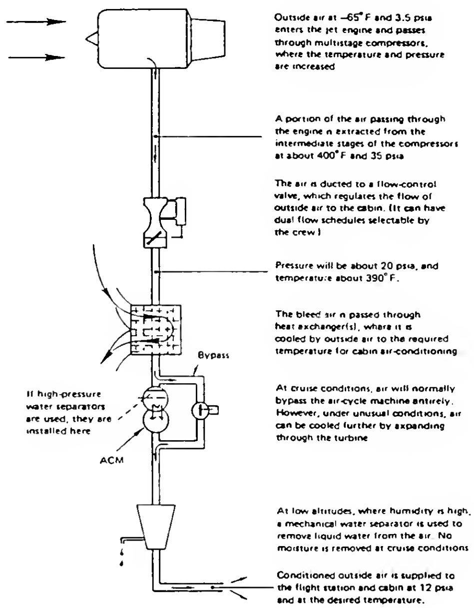
THE AIRPLANES

Older model airplanes, including the DC-9, the B-727, and half the DC-10s, provide 100% fresh air to the cabin.

To conserve fuel, newer models, including the MD-80, DC-10, B-737, 747, 757, 747 and A-300, 320 and 310, provide up to 50% recycled air.

THE VENTILATION SYSTEMS

Below is a generic picture of airline ventilation systems.



Operation of aircraft environmental control unit in cruise conditions at 35,000 ft.

On the ground, the plane may use air supplied by the engine, by the Auxiliary Power Unit (APU) or by high pressure carts. It is outside air, and can be contaminated by fuel and exhaust fumes and any other ambient air pollutants. The air may be filtered before it enters the cabin.

In flight the air is supplied by the engines. Outside air from the engines is adjusted for temperature and humidity prior to being pumped into the cabin.

Recirculated air is channeled through filters before being mixed with fresh air. Some planes use High Efficiency Particulate Air (HEPA) filters which are used in hospitals and can remove particles down to 0.3 microns. This is sufficient to catch bacteria, but not viruses or gases, including some components of ETS.

Efficiency depends on filter maintenance. Airlines state that they maintain the filters strictly according to manufacturers' directions.

In flight, the captain has the authority to adjust the flow of air to the cabin by turning down or off one or more of the "packs," or Environmental Control Units (ECUs).

AIR QUALITY

Contaminants of Concern:

Federal Aviation Administration (FAA) regulations establish standards for carbon dioxide, carbon monoxide, and ozone. Guidelines on other contaminants have been set by Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), the American Conference of Governmental Industrial Hygienists (ACGIH) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

FAA requires cabin pressure to be no more than 8,000 feet altitude, but sets no requirements for airflow.

Below is a chart of contaminants commonly found within the airliner cabin for which standards or guidelines have been established by various agencies and associations. Note that the FAA intends to bring its carbon dioxide standard into line with OSHA's.

US STDS FOR EXPOSURE
SELECTED SUBSTANCES

SUBSTANCE	EPA	OSHA	ACGIH (7)	ASHRAE	FAA
CO_2 (ppm)	none	5000	5000	2500(1)	30,000
CO (ppm)	9 (2) 35 (3)	50	50	9 (2) 35 (3)	50
NO_2 (ppm)	.05 (4)	5	3	.05 (4)	none
PARTICUL-ATES TSP ug/cu.m	75 (5) 260(6)	1500 (RSP)(2)	1500 (RSP)	Same as EPA	none
OZONE(ppm)	.12 (3)	0.1	0.1	.05	.10 .25(7)

Notes:(1) As odor surrogate; (2) 8 hr.; (3) 1 hr; (4) 24 hr (5) Annual; (6) 24 hr; (7) Time Weighted Ave.

Carbon dioxide: FAA on May 2, 1994, proposed lowering its standard from 30,000 parts per million (ppm) to 5,000 ppm, bringing it in line with OSHA's guidelines.

Ozone: Concentrations were not considered to pose health problems by the studies, but Sue Ludwig will discuss her work on this particular gas.

Viruses cannot be easily sampled for, if at all, with current technology, and are not included in the studies.

Biological contaminants and fungi: were found in studies to be below concentrations generally thought to pose risk of illness. However, there have been cases, which Dr. Hinman of CDC will address, where tuberculosis is suspected to have been transmitted via cabin air.

Cosmic rays: Flight and cabin crews receive cumulative doses of these galactic rays. The NAS and DOT studies recommended that FAA consider restricting exposure of pregnant crew members. Dr. Cone will discuss work he is conducting on the effects of cosmic rays on human reproductive systems.

Pressure: FAA regulations require cabin pressure to be maintained at no more than 8,000 feet, which may pose some hazard to at-risk populations.

Humidity: is generally below 25% in airplanes.

Temperature: is maintained at about 75 degrees.

Environmental Tobacco Smoke (ETS)

ETS is generally considered to pose considerable risk of cancer and other diseases to non-smokers, with the body of evidence continuing to grow. The NAS study recommended a total ban, while the DOT study (conducted during the ban on smoking on flights of two hours or less) recommended that "consideration be given" to a total ban.

Depending on the ventilation system employed, ETS has been found throughout the cabin, impacting allergic people despite their distance from smoking sections. It also reaches the cockpit on some configurations.

Flight attendants who spend their working lives in the close, smoke-filled environment on international flights will describe the deleterious effects they have suffered on international flights, where smoking is still permitted.

Pesticides

Certain countries require cabins to be sprayed with pesticides (against hitch-hiking insects) just prior to landing -- while passengers and crew are still on board. Spraying is either done by

flight attendants walking down the aisles with spray cans, or through the ventilation system. Despite label warnings that a commonly-used pesticide is hazardous if breathed or absorbed through the skin, they do get on peoples' skins and into the eyes and lungs. Passengers are not warned in advance, and people who are chemically sensitive, asthmatic or suffer from respiratory diseases can suffer severe reactions. Flight attendants who are frequently exposed are especially at risk. In the case of flight attendants, repeated exposures have led to claims of permanent disability.

The U.S. terminated this practice in 1979 because of health concerns and doubts about the efficacy of spraying.

The Department of Transportation in mid-April requested countries requiring spraying to provide information on which pesticides were used, in order to establish a passenger notification system; and urged them to reconsider the requirement for spraying while the cabin is occupied.

The Environmental Protection Agency has recently required one of the pesticide suppliers to submit additional acute toxic effect data on certain pesticides used on airplanes.

One widely-used pesticide, Aerosol Aircraft Insecticide, is the same formulation as Black Knight Roach Killer.

LEGISLATION

Representatives Nadler and De Fazio have introduced the Safe Cabin Air Quality Act (H.R. 2985) which would require FAA to issue regulations requiring airlines to provide passengers with not less than 20 cubic feet of fresh air per minute, monitoring of recirculating air filters, a minimum standard of humidity, and monitoring of ozone levels to assure compliance with current regulations.

The legislation would also establish a toll-free telephone number for passengers to report illnesses relating to air travel, and require the FAA to publish, on a quarterly basis, the reports of air travel-related illnesses and violations of standards established by the Act.

WITNESSES

Witnesses will include Members of Congress, representatives of DOT, FAA, EPA and CDC; flight attendants; the industry; scientists involved in cabin air studies; experts in relevant fields; and representatives of anti-smoking organizations.

AIRLINER CABIN AIR QUALITY

WEDNESDAY, MAY 18, 1994

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON AVIATION,
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION,
Washington, DC.

The subcommittee met, pursuant to call, at 9:45 a.m., in room 2167, Rayburn House Office Building, Hon. James L. Oberstar (chairman of the subcommittee) presiding.

Mr. OBERSTAR. The Subcommittee on Aviation will come to order.

Today we meet to review testimony from a wide range of witnesses on the air quality in airliner cabins. The interest level in this hearing has been exceedingly high, I suppose because, at least in part, it is an issue that anyone who flies understands or thinks they understand, or feels that they have been affected by it—the quality of air aboard an aircraft.

We have held two hearings on smoking aboard aircraft, and now that smoking has been banned—and one of those hearings, by the way, was over 11 hours in length, and the markup was even longer. I think we were here until 11 o'clock at night, if I recall, Mr. Valentine. I think that the gentleman from North Carolina defended his constituency exceedingly well that day.

But now that justice has prevailed and smoking has been stopped aboard aircraft, it is time to assess the quality of smoke-free aircraft. Two major studies have been conducted by the government, the Airliner Cabin Environment, Air Quality and Safety, which was conducted by the National Academy of Sciences; and Airliner Cabin Environment, Contaminant Measurements, Health Risks and Mitigation Options, which was commissioned by the Department of Transportation.

Most studies indicate that if smoking is banned, air is generally safe for healthy passengers. Well, it is true that the vast majority of the 475 million people who travel and 130,000 crew members who travel the airways fly safely and deplane generally as healthy as when they boarded. But air quality must not be considered only for the healthy; it must be considered for those who are sensitive to chemicals, those whose immune systems may be compromised, people who are cancer patients undergoing chemotherapy whose white cell count is depressed because of anticancer drugs that have effects on the immune system.

Any consideration of air quality must, as an equally high priority, include flight attendants who spend their working lives in the air-trapped cabin environment. As one flight attendant said so

poignantly during our hearings on smoking, this aircraft is my workplace; I have to spend my working days in it.

In 1990, Congress banned smoking on all domestic flights of six hours or less, yet the complaints over air quality continue. The mail that the subcommittee receives, the mail that I as Chairman of the subcommittee receive, questions that we get from constituents, questions that we hear from our colleagues are a literal catalog of complaints of headache, ear discomfort, sinus, bronchial ailments, viral infections, respiratory illness, throat and nose irritation and other ailments—dizziness, lightheadedness, physical ailments following flights, especially flights of longer than two hours.

Problems that are experienced by passengers are often magnified among flight attendants who don't spend just one or two or three hours aboard aircraft, but often 11 and 12 hours. Their symptoms range from those experienced by passengers whom they are serving to complete incapacitation, as we have heard reports on single flights, and often to permanent disability. Flight attendants almost uniquely in today's workplace still have to serve in a smoke-filled environment on international flights.

It is clear that people believe that the air quality is bad, and they believe it is bad because, as they are well aware, the newer generation of aircraft recycle up to half the air as compared to older generation aircraft that brought in almost 100 percent new air.

Furthermore, many people are convinced that the air has gotten worse since smoking was banned because they believe it is not circulated as often as when smoking was permitted.

Another issue looming larger in recent years is that of pesticides. Some foreign governments require that aircraft and their passengers be sprayed for insects prior to deplaning. The United States abandoned that practice in 1979. But nonetheless, the practice has—by other countries, has caused serious allergic reactions for both passengers and crew.

DOT has recently asked our trading partner countries to suspend spraying, and we will hear later extensive testimony from NIH about this issue in a very detailed discussion of it.

Airliner cabin air quality is not perfect, but the question is, is it as bad as people think it is? Is it worse than other closely confined and densely populated places? What would be the cost of improving air quality? Can airlines afford to do so? Would passengers who resist virtually any increase in fares be willing to pay any such price increase? Is it enough to tell passengers, on the other hand, to fly rested, abstain from alcohol on extended flights, drink lots of liquids, while they are meanwhile being exposed to a wide range of chemicals and atmospheric effects that in other ways make them ill.

Now that the smoke has literally cleared from the air and aircraft cabins, we have an opportunity to set the record straight, or at least begin to do so, on what the flying public is breathing, and what we need to know and what needs to be done.

Unfortunately, we already know as much as we need to know about what needs to be done, indicate that something must be done about smoking on international flights. We know all that needs to be known about spraying of pesticides; that ought to be stopped.

There are many other subjects that we are going to explore in some depth through a wide range of witnesses today, and I look forward to the testimony.

The Chair recognizes the gentleman, Mr. Duncan, from Tennessee.

Mr. DUNCAN. Thank you, Mr. Chairman. And certainly I appreciate your calling this hearing, and I appreciate all of the witnesses who have come to testify.

There is great concern about the quality of air that we breath, and there is great interest in this subject today. Like most Members, I don't get the chance to watch much television, but I did happen to see the presentation about this issue on 20/20 Friday night, and I did get to see our colleague, Mr. DeFazio; and certainly that was a very interesting presentation.

I am sitting—I am looking forward to hearing the testimony of the witnesses. I am sitting in as Ranking Member, as you know, for our colleague, Mr. Clinger. Mr. Clinger does have a statement which is very brief and would I like to read it at this time.

Mr. Chairman, as more and more people choose commercial aviation for intercity travel, and as more and more flight attendants opt to make an entire career of flying, the quality of the aircraft cabin environment becomes a much more significant health and safety issue. To the same degree that the Federal Government establishes and enforces standards over the air quality in office buildings and factories, the flying public and those whose profession puts them in airplanes for most of each working day deserve some level of assurance that the air they breath does not present a threat to their well-being.

The Federal Government has, I believe, taken the obvious first step by prohibiting smoking on domestic flights. The elimination of cigarette smoke has greatly improved cabin air quality.

We are now at a point where additional improvements will be more difficult to accomplish. Banning smoking on domestic flights affected all carriers equally and was easily accomplished and enforceable. However, banning smoking on international flights won't be so simple, and the competitive consequences will not be equally shared among carriers of different nationalities if their respective governments adhere to different standards.

When we look beyond smoking and explore the questions of appropriate air flow rates, recirculation and filtering and all of the other variables that affect cabin air quality, we begin delving into very, very subtle and technical differences that may result in no harm for short-term exposure, but over time might have serious consequences.

I want to thank our many witnesses for taking time from their personal schedules to appear before our subcommittee today, and I look forward to your statements.

[The statement of Mr. Clinger follows:]

Opening Statement of
The Honorable William F. Clinger, Jr.
Before the Aviation Subcommittee Hearing on
Cabin Air Quality
May 18, 1994

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I want to thank our many witnesses for taking time from their personal schedules to appear before our Subcommittee today. I look forward to your statements.

Thank you, Mr. Chairman.

Mr. DUNCAN. Mr. Chairman, we thank you; and certainly you have done an outstanding job of outlining the issues that we will cover today. I thank you very much.

Mr. OBERSTAR. I thank the gentleman.

Are there other Members who wish to make opening statements?

Mr. LIPINSKI. I have a statement that I would like to have included in the record.

Mr. OBERSTAR. Without objection, so ordered.

Mr. LIPINSKI. I am anxious to hear the witnesses also, so we will move on.

[The statements of Mr. Lipinski and Mr. Blackwell follow:]

OPENING REMARKS OF CONGRESSMAN WILLIAM O. LIPINSKI

Mr. Chairman, I want to thank you for holding this hearing today and I look forward to hearing the testimony—on a subject which I have great interest.

Of course, when the issue of air quality in aircraft comes before someone who is both a smoker and a frequent flyer—you can be sure that they are going to be interested. But in my case, I may not be as interested for reasons you might think.

The U.S. Department of Transportation has spent a great deal of time and effort to make sure that our nation's airlines fly safely. When it comes to making sure that aircraft equipment is properly maintained, the FAA appears to be doing a fine job as well.

But, what about the long-term effects that flying may have on the people who pilot the planes and serve the passengers? Is there something more that can be done to ensure that the men and women who make up our nation's airline industry are being provided with the safest working environment?

On more than one occasion this subcommittee has taken action to protect airline employees.

We supported legislation to ban smoking on domestic flights. We supported legislation to provide flight attendants with duty-time requirements.

Finally, we have also supported the right of airline workers to strike without fear of losing their jobs.

Admittedly, while I was supportive of each of these measures, not all of us were in agreement.

But, the members of this subcommittee do agree on one thing. It is our responsibility to investigate issues like air quality on the nation's aircraft and then take appropriate action.

In this regard, I want to go on record as being especially concerned about the use of pesticides on some flights.

Over the past several months I have been contacted by constituents who have traveled overseas and sprayed with pesticides on arrival at their destinations. I have to admit, when I first heard of this, my initial reaction was disbelief quickly followed by outrage.

It's been over 15 years since the U.S. stopped spraying and we stopped because there was little evidence to justify a continuation of the program.

Today, there is simply no reason why this practice should be allowed to continue. I think that this issue—one of spraying potentially harmful chemicals on unsuspecting passengers—is just as important as making sure that aircraft are well maintained.

I am especially glad to see representatives of DOT and the EPA here today. Both agencies need to work together on this issue to ensure that toxic chemicals are not being released into aircraft cabins, especially to kill bugs that may, or may not, even be there.

STATEMENT OF CONGRESSMAN LUCIEN E. BLACKWELL

Mr. Chairman, recent hearings in the Congress have drawn attention to the serious problem caused by exposure to smoke by non-users.

The effect of airline cabin air on both passengers and crews presents this problem in perhaps its most compelling dimensions. Today's hearing is, therefore, an important part of this ongoing discussion.

With the widespread occurrence of lung cancer and other respiratory diseases, it is crucial that we focus on preventing the causes of such diseases, particularly in densely populated, confined areas.

There are far-reaching health implications associated with this debate, and as we consider our options, we must be realistic as well as cautious in designing measures to ensure healthy air in airline cabins.

In the past, we have concerned ourselves only with the adverse effects of smoke on passengers. It has now come to our attention that the flight crew, particularly flight attendants, are at least equally exposed.

International flights of more than six hours duration are a great cause of concern, inasmuch as smoking is permitted on these flights. And, flight crews who regularly service such flights face real danger.

Mr. Chairman, our colleagues, Mr. Nadler and Mr. DeFazio are to be commended for their efforts to require the FAA to provide passengers with not less than 20 cubic feet of fresh air per minute.

They are also to be applauded for pushing for monitoring the recirculation of air filters, establishing a minimum standard of humidity and monitoring ozone levels to assure compliance with current regulations.

In light of the gravity of the circumstances surrounding the issue before us today, I welcome the witnesses who will appear to testify this morning and to share their perspectives with us on this vital matter.

Mr. OBERSTAR. Are there any other Members that wish to be heard?

Mr. Valentine.

Mr. VALENTINE. Mr. Chairman, just briefly, I can't let this occasion pass without reminding the Chairman and other Members of the subcommittee when we had the scrap here on airline smoking, the only argument that this Member ever made was that we should wait for the report which the taxpayers had paid for, was commissioned and due in 1986. And the record will show that I stated to the committee that we might just find that there were other problems besides smoke in the airplane cabins, and we are hearing what has happened since then has confirmed that.

I don't want to see the Congress place any special burden on commercial airlines, but I don't think we are ever going to approach a solution to the problem until we require those airplanes to be ventilated. An airplane cabin is a very special place, and until we require the removal of stale air and things of that kind, I don't think we are going to do anything except have a lot of conversation.

But I appreciate the favorable mention by the Chair that North Carolina is many, many things other than the tobacco plantation. Thank you, Mr. Chairman.

Mr. OBERSTAR. It is also the home of the National Institute of Environmental Health Sciences and the——

Mr. VALENTINE. And the Research Triangle Park.

Mr. OBERSTAR. The Chair will note for the record that the gentleman advocated very persuasively and very effectively in that 14-hour markup that we had and prevailed by one vote. It was a majority, and the gentleman won the majority that day.

Mr. VALENTINE. Thank you, Mr. Chairman. That was a very rare moment of wisdom which the Chairman overcame forthwith.

Mr. OBERSTAR. Our first two witnesses are two Members of this committee who have been strong advocates—Mr. DeFazio, throughout his service in the House and on this committee for action on this subject, both of smoking and of cabin air quality in general, and a gentleman from New York, Mr. Nadler, a strong advocate for clean air, environmental—internal clean air, as well as external—and we welcome both of our colleagues to the witness table this morning.

The Chair recognizes the gentleman from Oregon, Mr. DeFazio. Thank you for being here and for advocating this hearing.

TESTIMONY OF HON. PETER DeFAZIO, A REPRESENTATIVE IN CONGRESS FROM OREGON

Mr. DEFAZIO. I thank the Chair, and I thank the Chair for his interest, the scrutiny of the committee, and I know his long-term commitment to a safer and clearer cabin area. I remember that epic 14-hour battle myself, and it is a shame we had to let the Appropriations Committee carry the day, but we tried our best.

Mr. Chairman, in your introductory remarks, when you were talking about the advice to passengers, I thought of one additional. You said about the avoidance of alcohol, staying well rested and drinking lots of liquids. Unfortunately, on many flights we would have to add the advisory, don't breathe; and that is difficult, particularly during the duration of flights that most people take.

My flights, it would be very hard. I log about 170,000 miles a year on commercial aviation, over 1.3 million miles since I came to Congress, so I have a lot of time to talk to flight attendants, pilots and other passengers, and to make my own subjective observations of the conditions in the cabin.

In addition, in my first term, due to a prior commitment of Chairman Mineta when he chaired Aviation, I had the privilege of chairing a subcommittee hearing on the issue of cabin air quality and learned a lot that piqued my interest, and have maintained that interest to this day.

We have made some progress. As the Chairman noted, we have made progress on the issue of smoking on the domestic flights, but there are other problems that remain. In particular, the FAA has yet to promulgate workplace health and safety regulations for aircraft.

Now, 20 years ago, they took an exemption from OSHA; and since I have been in Congress, every time I get an FAA official before me, I say, when are we going to see the workplace health and safety regulations for aircraft, including air quantity and quality? Oh, soon, Congressman, soon. Well, I have been here seven-and-a-half years. Soon has not yet arrived.

Perhaps we will hear something today, or maybe in the near future, from the FAA that they are going to finally take action in this area.

In the meantime, we have developed a whole new generation of aircraft which are capable of providing less fresh air to passengers. Now, this is not entirely accurate, because up in the cockpit it is still great. They get more frequent air changes than anyplace else on the plane. When I asked about that, I said, well, if it is necessary for the pilot's health. They said, oh, no, no, no, it is not for the pilots, it is the instruments. The cabin air quality would degrade the instruments in these modern planes if we didn't provide special air circulation?

I said, what about lungs, if we are worried about electronics? Well, Congressman, that is, you now, not a concern of the industry or the FAA. Or at least not of enough concern to have taken action in this area.

Then you go to First Class and, yes, you get a bit more air circulation in First Class, but you get back to steerage, or coach, as they call it on some of these flights, particularly your 16-hour overseas flights on some of these newer, longer duration aircraft, and you are getting a miserable quality of air; something that would be found to violate OSHA standards here in the United States of America for workplaces for individuals.

Flight attendants are subjected to this every day. Some passengers quite frequently, others infrequently. And to add insult to injury, now we have the issue on the overseas flights that has finally arisen regarding the spraying of pesticides.

This is not some idle sort of concern or problem. The pesticide that is being used has a label. And the label says, hazardous to humans and domestic animals; harmful if swallowed or absorbed through the skin; avoid breathing vapors. Tough to do on an airplane, particularly when they shut off the circulation system. Avoid contact with skin and eyes. Tough to do when they spray it at you and over your head. Remove pet birds and covered fish aquariums. Luckily, we don't have fish aquariums on airplanes.

Ventilate area before entering. Well, I suppose we could decompress the plane, however, directions for usage say, use while aircraft is in flight or on the ground prior to takeoff. Somewhat contradictory to all of the precautions. Use at least 30 minutes prior to airplane, crew and passengers are on board and all hatches, ventilation openings are closed. Stop ventilation system for a period of not less than three minutes after spraying.

So this is the conundrum with which we are presented. The substance is declared hazardous to humans. We are not supposed to breath it, touch it; you are not supposed to be in proximity to it, you are supposed to ventilate the area and at the same time we close down the ventilation and spray people with it and make them breath it.

There have been some very serious reactions. I will be submitting a statement for the record later which goes into some of that. But I believe that we need to encourage two or three actions.

One, get the FAA to finally promulgate workplace, health and safety regulations, including cabin air quality standards, which include not only a design standard which—I think we are headed in the right direction with design standards, but an operating standard. Many of the older planes can provide more fresh air; they just choose not to do it because they can save a little bit of money by starving the passengers of fresh air changes.

Secondly, we need to look at the issue of the pesticides on an extremely urgent basis.

I congratulate Secretary Peña after 12 years of Reagan and Bush sitting by idly while Americans were poisoned; he has begun action. But I believe we need to take even stronger action, and I am going to circulate a letter among the committee Members today which is coauthored by myself and Senator Leahy to the President.

[The information follows:]

Congress of the United States
Washington, DC 20515

May 18, 1994

The Honorable William J. Clinton
The White House
Washington, D.C. 20500

Dear Mr. President:

We are writing to bring to your attention a matter of great importance to the health protection of American air travelers. We respectfully request that you take the most expeditious steps possible, to change the World Health Organization (WHO) regulations which endorse the spraying of insecticides on international commercial flights.

Many of the 15.2 million passengers traveling on U.S. airlines to the Caribbean, South America and the South Pacific every year are unknowingly sprayed with an insecticide prior to landing. This policy is based on WHO regulations which endorse the spraying of insecticides on boarded aircraft for pest and disease control.

We believe the WHO policy regarding in-flight spraying of insecticides is ineffective as a means of pest control and potentially harmful to human health. The United States Centers for Disease Control and Prevention (CDC) ended this practice in the United States 15 years ago citing these same concerns and stating that "disinsection of aircraft has never been shown to be highly effective in disease control or in species containment."

The health hazards of spraying passengers with insecticides are obvious. The warning label for the product registered for this use in the United States clearly indicates that it is a "hazard to humans" and that users should avoid inhaling the product or bringing it in contact with the skin and eyes. There have been numerous complaints from flight attendants and passengers experiencing health problems after spraying. People with respiratory problems or chemical sensitivities are at special risk.

Department of Transportation Secretary Pena has written to countries around the world urging nations that spray incoming flights to reconsider their disinsection practices. Alternatives are available to in-flight spraying -- alternatives that are safer and much more effective. Some countries are already adopting these alternative methods.

Countries across the world look to WHO for guidance when establishing public health protection policies. The labels on airline disinsectants themselves use WHO's regulations in describing the proper use of those products. It is imperative that those regulations provide public health protection.

I am sure that you share our belief the U.S. government has a responsibility to protect its citizens both here and abroad. To provide that protection, WHO's outdated and ineffective aircraft disinsection standards must be revised. We urge you to take the lead in bringing about those changes.

Sincerely,

PATRICK LEAHY
United States Senator

PETER DEFAZIO
Member of Congress

cc. Department of Health and Human Services Secretary Shalala

202-224-2035

PATRICK LEAHY
CHAIRMAN

United States Senate

COMMITTEE ON
AGRICULTURE, NUTRITION, AND FORESTRY
WASHINGTON, D.C. 20510-6000

NEWS RELEASE

STATEMENT OF SENATOR PATRICK LEAHY (D-VT)
Before the House Committee on Public Works and Transportation
Subcommittee on Aviation
May 18, 1994

I want to thank Congressman Oberstar for holding this hearing today and especially for addressing the very legitimate concerns about the use of pesticides on airlines.

Every year millions of Americans fly to the Caribbean, South America, and the South Pacific -- often on vacations with their families. What most of these people do not realize is that during their flight they will be sprayed with an insecticide most familiar to them as Black Knight Roach Killer.

I expect that they would be especially surprised to know that the label of this product specifically warns against its inhalation or direct contact with skin and eyes. When someone is spraying for roaches in their home, that makes sense-- they are free to leave the room or even the house. During a flight to the South Pacific, leaving is obviously not an option.

I have been working with the Department of Transportation (DOT) and the Environmental Protection Agency since February to change the way flights from the United States are disinsected. I joined Secretary Pena in that effort by urging each of the countries identified by the Air Transport Association as requiring disinsection of incoming flights, to comply quickly with DOT's request for information on their disinsection practices.

Passengers have the right to know **before** purchasing their tickets whether they will be sprayed with an insecticide during their flight. Only with accurate information on which countries require this practice, can we ensure that this information is available for all passengers.

Equally important, is the need to change international standards for aircraft disinsection to reflect the development of safer, more effective disinsection practices.

I am pleased to join Congressman DeFazio in sending a letter to President Clinton, requesting his assistance in bringing rapid change to the World Health Organization's (WHO) regulations on the spraying of pesticides on airlines. WHO's regulations endorse in-flight spraying as an effective means of pest and disease control. As we mention in our letter, the Centers for Disease Control and Prevention ended this practice in the United States 15 years ago citing ineffectiveness and safety concerns. It is time that WHO ended this practice as well.

Clearly, spraying pesticides on the passengers and crew of commercial flights does not work. It does raise considerable health concerns-- especially for people with respiratory problems or chemical sensitivities. I have enclosed copies of some of the letters I have received from people who have been sprayed during a flight, describing their experience and the need for change.

The international community turns to WHO for guidance in setting public health protection standards. The United States government has a responsibility to ensure that those standards protect the health of American air travelers. The current international regulations for airplane disinsection do not provide that protection.

I applaud Congressman DeFazio for bringing this issue before the Committee, and I urge you all to join us in our effort to protect the health of American air travelers here and abroad.

83-115 O - 94 - 2

KARYN L. PLANETT

To	Senator Patrick Leahy
Fax #	202 224 4242
Fm	Karyn L. Planett
Fax #	415 927 3613
Re	Pesticide spraying on commercial aircraft
# pages	6 including this one

I read an article in the New York Times regarding your experience on a flight to Australia. Please read my correspondence with United Airlines regarding a terrible situation that happened to me during the spraying of the cabin prior to our landing in Sydney March 8, 1994.

As you can see by their attached response dated April 18, 1994 I have not received a reply from them to date.

PLEASE call me if you wish to discuss this further. PLEASE use my information if it will help you in your push to control this terrible practice.

I shall be available at 415 461-6175 to talk.

Thank you for all your efforts on the flying public's behalf.

Karyn L. Planett
KARYN L. PLANETT

cc: Rep. James Oberstar

15 BLUERIDGE ROAD KENTFIELD. CA. 94904 PHONE· 415 461-6175

KARYN L. PLANETT

March 29, 1994

United Airlines
Consumer Affairs - EXOPW
P. O. Box 6610
Chicago, IL. 60666

RE: United Airlines Flight 1123 Los Angeles / Sydney 3/6/94

To Whom It May Concern:

I would like to report to you an incident that occurred during the above-referenced flight. I was a passenger on that flight.

Prior to my departure date I spoke with a United Airlines representative, via the 800 number, regarding the potential for pesticide spraying of the aircraft upon its arrival in Sydney. I am an asthmatic. I have been reading in the travel trade publications recently that if one has breathing problems he/she may be exempted from exposure to the pesticide spraying of an aircraft cabin. The United Airlines representative advised me over the phone that the chemical which is sprayed by the Australian authorities is "Pyrethrum." He further advised me to get a letter from my physician stating my condition and I would be exempted from the spraying of this chemical.

I spoke with my physician, Dr. Edward A. Meill, about this issue. He was concerned about my exposure to this chemical and wrote a letter, dated March 1, 1994, addressing this matter. It is attached. Per the United Airlines representative's direction, I discussed this written request with the flight attendants upon boarding the Los Angeles / Sydney aircraft March 6, 1994.

They advised me that it was impossible for me to be exempted from exposure to the pesticide. They did offer to do all they could

15 BLUERIDGE ROAD KENTFIELD, CA 94904 PHONE/FAX 415 461-6175

onboard the aircraft, however I would have to be exposed to the pesticide prior to landing in Sydney.

Approaching Sydney, the flight attendants moved me from my seat, 1A, to the first-class lavatory and provided me with a wet towel to cover my face. I remained in the lavatory throughout the spraying with the wet towel over my face and a wet paper towel over the air intake in the lavatory. The flight attendant said she would try to spray in the aft cabins reducing my exposure to the chemicals. She told me to remain inside the lavatory until she knocked, which I did.

I returned to 1A feeling as though I got through everything OK and there was really no need to worry. Shortly thereafter I started to become dizzy. I asked my husband, Geoffrey Thompson seated in 1B, if he was dizzy and he replied, "No." At that point I began to black out and made my way to the flight attendants standing in the first class galley.

They seated me in the jump seat and administered oxygen until this blacking out period had subsided. Ultimately I returned to my seat and landed still taking the oxygen with the oxygen bottle strapped to my seat belt.

I deplaned and spent the next several hours pretty dazed.

The following morning I phoned the Sydney office of United Airlines and spoke with Ms. Pina Lal who was very helpful. She said I COULD HAVE BEEN DEPLANED after landing and prior to spraying IF the United Airlines representative had put this information into the record as he should have.

She advised me that "auto spraying" would not have happened if this message had been in the system. When requests such as this are made, UAL Sydney advises the Australian authorities and the passenger is allowed to deplane prior to spraying.

Page 3
United Airlines

Ms. Lal further advised me to put this in writing to you and to copy in her Station Manager, Mr. Garth Petersen, which I am doing.

I am a travel writer by profession. I spoke with the U.S. Consul General, Mr. Donald Tyson, in Sydney about this spraying. He advised me to address the issue of the spraying of passengers with pesticides in the press for he believes that would garner the best results. I chose, instead, to try to address this issue personally with United Airlines.

Please understand how dangerous the exposure to chemicals is to people with breathing problems and how important it is for all of us to have the system work on our behalf. I believe I did all that was asked of me by United Airlines and the system failed me.

I look forward to your reply to my report.

Kind regards,

KARYN L. PLANETT

ENC: Dr. Edward A. Melli's letter
CC: Mr. Garth Petersen, Station Manager
United Airlines
2nd Level, Pier C
Sydney International Terminal
Mascot, N.S.W.
AUSTRALIA 2020

Asthma and Allergy Clinic of Marin

Edward A. Melli, M.D.
Diplomate, American Board of Allergy and Immunology
Assistant Clinical Professor, UCSF

1321 South Eliseo Drive
Greenbrae, California 94904
(415) 461-8909
Fax (415) 461-3772

March 1, 1994

TO WHOM IT MAY CONCERN:

Ms. Planett is under my care for very severe chronic asthma and allergic rhinitis. Avoidance of exposure to allergens or irritant substances is of great importance. Pyrethrum is an insecticide that has high potential for both allergic and toxic reactivity. If there is any possible opportunity to allow her to be excused from exposure to this spray, it will be in her best interest.

Thank you for your consideration. If I may be of assistance with any additional information, please do not hesitate to contact my office.

Sincerely,

Edward A. Melli, M.D.

UNITED AIRLINES

Executive Offices

April 18, 1994

Ms. Karyn L. Planett
15 Blueridge Rd.
Greenbrae, CA 94904

Dear Ms. Planett:

We're sorry for the problems you encountered aboard Flight 815 on March 6 and offer our regret for the illness you suffered. We are looking into the matter and will be getting back to you as soon as possible.

Thank you for your patience.

Sincerely,

L. Barr

Larry Barr
Customer Relations
International

REF #: 0959044A

LB/cl

P.O. Box 66100, Chicago, Illinois 60666 • Location: Elk Grove Township, Illinois, on Route 62, one half mile west of Route 83

Diana Fairechild . Box 300 . Makawao HI 96768 . 808/572-5252

May 2, 1994

Patrick Leahy
US Senator Vermont
433 RSOB
Washington DC 20510

RE: Pesticide in planes

Dear Senator Leahy:

I heard that you are interested in the subject of pesticides in planes. I am hoping that you will take up my cause.

An injustice is being perpetrated here by the State of Hawaii Labor & Industrial Relations Appeals Board. I ask you to look into the case of Diana Fairechild, a flight attendant disabled in 1987 by <u>pesticide sprayed on her in her workplace</u> inside United Airlines planes (Case # AB 90-1820).

My hearing took place in 1991 and they simply have not made a decision. Why?

I am on a medical leave of absence without financial assistance— neither from the state, nor from the airline. I am prevented from filing a personal injury suit because I was, and still am, an employee of United Airlines, though I have received no income from United Airlines since 1988. I cashed in my IRA and all my savings within two years of becoming disabled. My medical insurance will not pay for most of my medical bills because United Airlines will not recognize my illness. Ironically, the airline will not allow me to use my travel passes because I am ill. Basically, United Airlines has influenced the State of Hawaii Labor & Industrial Relations Appeals Board to deny me the benefits I am due as a loyal employee of 21 years. I am on a medical leave of absence for 6 1/2 years now. United's policy is to fire employees whose medical leave extends beyond 7 years.

During the 21 years I worked for the airlines, I was forced by them to be repeatedly exposed to pesticide (to inhale it, to have it on my skin, in my eyes, and on my clothing). Because of these

workplace exposures (I estimate over 100 of them), I have acquired multiple chemical sensitivities (MCS). MCS is the total breakdown of the body's ability to detoxify everyday chemicals, beginning after either a longterm or a significant exposure to a toxic chemical.

I filed for Workers' Comp in mid 1988. The first hearing was held in January 1989. United disputed, and still disputes, both the validity of my illness and the fact that it occurred on the job.

A year later, on a technicality, I was denied compensation by the Director of Labor & Industrial Relations. The Director felt that my previous history of flying for Pan Am relieved United Airlines of responsibility for my condition; he ignored the fact I had never been disabled while I was with Pan Am. The Director also ignored the fact that United acquired me as a vested employee (transferring my full seniority from Pan Am) and after a complete physical examination along with my written statement that I was allergic to the pesticide used on their planes in New Zealand.

The Director failed to address the fact that during the latter years I was with Pan Am, and then, at the beginning, with United, I was able to recover within days of having been sprayed with pesticide. Ultimately, however, I ceased to recover, and became totally disabled. Yet, even if my disability were to be considered an "aggravation" of an earlier injury from my years with Pan Am, it is still compensable under Workers' Comp, I am told.

The Director's decision also shows that he confused the word "sensitivity" (used in a report by a physician to explain the allergic reaction I experienced from pesticide) with the name of the illness which disabled me, multiple chemical sensitivities. MCS manifests as allergic-type reactions to numerous chemicals found in everyday life including pollution, and even perfume. I cannot work in proximity to chemicals that people normally wear (body lotion, hair conditioner, deodorant); I cannot work in an office (carpet, copiers, air conditioning); or even in a city (car exhaust, cleaning/construction materials, personal chemicals).

I filed for Appeal. United's law firm placed a new associate attorney in charge; soon she was pregnant and the case had to be delayed a year for her. As the hearing time finally approached, suddenly their expert witness was on vacation and the case was delayed another six months. All hearings were eventually completed four years after the onset of my illness, in the fall of 1991. All briefs were filed in December 1991.

No decision has yet been announced. No reason for the delay has been given.

A year ago, I asked to reopen the evidentiary portion of my case due to a preponderance of new evidence in the field of MCS, but also as a result of a 1992 California case which United had lost to a passenger with MCS (Malloy V United). United's position against Malloy was that MCS is imaginary. The airline refused to provide Malloy with the supplemental oxygen her doctor required. United lost (#CV 92-0125 FMS San Francisco District Court).

United's position against me—that MCS is imaginary—has also beer invalidated. MCS has been well-documented by eminent doctors and, sad to say, tens of thousands of victims have been claimed from pesticide exposures, and also from Sick Building Syndrome and the Gulf War Syndrome. This supports the testimony of my treating psychiatrist, required by United, who determined that I am and have always been of sound mind, and that I now suffer physical symptoms of MCS.

My motion to reopen the case was denied. No explanation was given.

Several months ago, it was disclosed that the brand of insecticide used on the aircraft (on United) is actually Black Knight Roach Killer—but with a different label. The aircraft label states, "Spray all spaces within the aircraft...with crew and passengers on board," with the contradictory advice, "Hazardous to humans.. avoid breathing vapors. Avoid getting on the skin." The "Killer" label states, "If inhaled, remove victim to fresh air." Obviously, this is impossible on jets in the enclosed cabin. Nor is it permitted, in places like New Zealand where the local authorities come on board after landing and discharge six cans of pesticide across the aisles a couple of inches above our heads; we, required to have our seatbelts fastened, sit there for the 15-minute "saturation period" with the air conditioning off.

United argues that I did not become sick on the job. However, my treating physician testified that I became sick as a result of the pesticides sprayed on me in my workplace; and flight log reports and other physicians' reports show a well-documented chronology of acute symptoms ("eyes dripping yellow pus within hours of spray"). In addition, after being tested in Straub Hospital in a double blind study with the aircraft insecticide, it was documented that I am allergic to it.

Last month, Secretary of Transportation Federico Pena wrote, on President Clinton's behalf, to 20 countries (according to *The New York Times*) where the pesticiding of passengers and crew still takes place. "Concern over the spraying of insecticides inside the aircraft cabin is based on possible long-term health effects," Pena told them.

I have health problems now for seven years. The proximity to chemicals aggravates my symptoms, so I reside in isolation. I attempt to eke out a living from home as a writer, while the bulk of my time and money is consumed by health issues: frequent seizures in the limbic part of the brain, internal bleeding, rashes, fevers, digestive problems, and on.

Notwithstanding, two years ago, with some assistance, I was able to self-publish a book, *JET SMART* (information inclosed). The writing was done when I was flying, in response to the suffering I observed around me. For the record, I am still in debt for the publishing costs, as well as for my basic living expenses since I had to stop flying. However, though the sales of this small edition have not brought a profit to me, the book itself has attracted a lot of publicity; in particular the section on environmental health which has helped to bring to public awareness, among other things, both airline practices of pesticiding passengers and of routinely turning down the air to save on fuel. The press has responded with verve. Some of the pieces which mention my book and/or my pending case are:

Conde Nast Traveler, "How long before toxic sprays are banned?";
The New York Times, "For..passengers..the doctor's office";
Forbes FYI, "..a flight attendant tames jet lag";
American Express Newsletter, "A Healthy Way to Fly";
Business Week, "Clearing the Air Indoors";
Barron's, "Lofty Spraying Bugs Travelers So Pena Pens a Protest";
Townscend Letter for Doctors, "Unfriendly skies";
Successful Meetings, "Anti Pesticide Forces Get a Proponent";
Sacramento Bee, "Spray Humans with Roach Killer?";
Environ, "Everything you may not want to know about flying"; and
Earth Journal, "Flying In the Mist."

All of these reviews, and many more, came without the aid of a publicist. Clearly the subject of pesticide in planes is of public concern. In this regard, I've just been told by a reporter that the product, Airosol Aircraft Insecticide (which was sprayed on me and which is still in use today worldwide), also contains a long list of "secret" inert ingredients including other known toxic

chemicals such as DDT; and that this information is to be part of the upcoming Congressional Hearing—scheduled for May 18.

With these latest developments in mind, I ask that the State of Hawaii Labor & Industrial Relations Appeals Board make a decision on my case, in my favor, to relieve the financial burden I have been carrying now for 6 1/2 years.

Pesticide residue is an accumulative poison. It affects our nervous systems, our digestive systems, our immune systems, our reproductive systems, our hearts—and it can kill us.

I ask for help now both from the powerful, like you, and from the All Powerful. Any effort you take on my behalf to facilitate the decision of my Workers' Comp case will be greatly appreciated by me. Any effort you take against the practice of pesticiding passengers and crew will be greatly appreciated by all those who are still sprayed—every year more than 20 million strong...but getting weaker.

I sincerely appreciate your help,

Diana Fairechild

Diana Fairechild

cc: Vice President Al Gore
Secretary Federico Pena
Senator Daniel Inouye
Representative Patsy Mink
Carol Browner, EPA
George Ewing, MD
Coalition for Alternatives to Pesticides

Thomas
Jefferson
University

Office of the
President

1020 Walnut Street
Philadelphia PA 19107-5587
(215) 955-6617

April 26, 1994

The Honorable Patrick J. Leahy
433 Russell Senate Building
Washington, DC 20510-4502

Dear Senator Leahy:

I just read in the Sunday, April 24, New York Times that you are concerned about the quality of air in airline cabins. As a physician, I must echo your concern. Although the prohibition of smoking on domestic flights was a quantum step forward, much still has to be done. There are some sound studies which show that the decreased fresh air ventilation in airline cabins, sets the stage for contagion and the spread of bacterial and viral illnesses. The low humidity and recirculated air aggravate pulmonary, allergic, and eye conditions. For passengers, this hostile environment is bad enough, but for cabin attendants, it is terrible! To top it off, being sprayed with a roach insecticide, simply cannot be healthy.

Concerning international flights, I would urge that the United States require at least a certain number of smoke-free international flights. Right now, there is simply not a sufficient number of smoke-free international flights. Such flights are usually longer than domestic ones and by the time one reaches his or her destination, the quality of the air in the cabin is markedly worse than on a domestic flight - particularly on those which permit cigarette smoking.

I am so pleased you and your staff are willing to investigate and confront this problem. It is an important public health issue!

Sincerely,

Paul C. Brucker

Paul C. Brucker, M.D.

PCB:bae

MET

Metropolitan Opera Association, Lincoln Center, New York, New York 10023 (212) 799-3100

Henry W Lauterstein, General Counsel

April 25, 1994

Honorable Patrick J. Leahy
U.S. Senate
Washington, DC 20510

Re: N.Y. Times Article - 4/24/94
"Panels in Congress to Act on Improving Air Quality on Aircraft"

Dear Senator Leahy:

I'm fully in accord with you regarding legislation against insecticide spraying on aircrafts. I'm going to Venezuela and until last week when I read Martin Tolchin's article in the Times I was not aware of this procedure. I faxed my thoughts on the matter to him and he in turned apparently got in touch with American Airlines (my carrier) who upon my request for information regarding spraying (I am allergic) were extremely disinterested and annoyed. Subsequently I received two calls from American's public relations explaining their procedures, etc. (I have bought myself a mask to use prior to spraying)

I feel very strongly about this matter and my name can be put on the top of your list of supporters for anti-spraying.

Sincerely,

Melitta Anderman

Melitta Anderman

Mr. DEFAZIO. And this letter says, in summary, that since these countries which require the spraying of dangerous pesticides on passengers are relying on a WHO, World Health Organization, advisory, we are asking the President to leverage the WHO to remove this advisory, to do the same thing the United States of America did 15 years ago, admit this is not effective in terms of getting insects or preventing insect infestations; but it is very effective in terms of dousing passengers with dangerous insecticides, and therefore the practice should be stopped.

And then, beyond that, you know, I urge the committee to go forward even beyond these immediate issues. Other concerns were raised at earlier hearings which I don't believe have been adequately addressed having to do with on-board fires and other sorts of concerns.

So I welcome the scrutiny of the committee and the energy of the Chairman on this issue and will, after I subject myself to whatever questions the panel has, will be happy to return to the dais and take my place with the committee.

Mr. OBERSTAR. We welcome you back.

Mr. DEFAZIO. Thank you, Mr. Chairman.

[The statement of Mr. DeFazio follows:]

STATEMENT OF THE HONORABLE PETER DeFAZIO BEFORE THE SUBCOMMITTEE ON AVIATION May 18, 1994

The issue of airline cabin air quality is a Kafka-esque nightmare that never ends. It seems like only yesterday this committee was holding its first hearings on improving aircraft cabin air quality. Yet here we are again today, almost a decade and a half later, discussing many of the same health concerns that continue to plague the flying public and working men and women.

Every few years, it seems the problem of poor cabin air quality rises to the surface and a familiar scenario plays itself out. Provoked by a news story, Congress springs into action with hearings and oversight. Meanwhile, the Federal Aviation Administration (FAA) wrings its hands and shortly before the hearing proposes a minor regulatory change to address the glaring loophole of the day. And without fail the industry reacts with a study or action of its own designed to appease the concerns of wary travelers. If we're lucky, Congress approves legislation to require another study of the problem.

While this pathetic scenario unfolds time and again, millions of Americans are continually exposed to cabin air ranging from stuffy and uncomfortable to dangerous and toxic on some overseas flights. And very little has been done to correct the situation.

My colleague, Rep. Jerry Nadler, and I have proposed legislation to finally address some of the air quality problems we experience and hear about every day. Our bill, the Safe Cabin Air Quality Act, would move beyond rhetoric and require for the first time ever a minimum standard for fresh air circulation aboard airplanes. It's something that should have been done long ago.

There is ample evidence, both empirical and anecdotal, to justify this standard. The 1986 National Academy of Sciences study recommending maximum air flow with full passenger complements is more than adequate defense for such a standard. And the Centers for Disease Control and Prevention study citing the risk of contracting infectious diseases aboard aircraft should give all of us pause when boarding our next flight home.

Or take, for example, times when aircraft cabins are sprayed with insecticides just prior to landing on certain international flights. Some things are obvious, or so they would seem. Common sense dictates that when a product label explicitly says "AVOID CONTACT WITH SKIN OR CLOTHING... PROVIDE ADEQUATE VENTILATION OF AREA BEING TREATED... **DO NOT SPRAY ON HUMANS**," you follow that advice. No questions asked.

But the international community and United States aviation policy stand this logic on its head. The industrial equivalent of Black Knight Roach Killer is routinely sprayed on passengers flying into the South Pacific, South America and the Caribbean. Directly above their heads. In a closed environment. Without ventilation. Without warning.

This fumigation releases toxic and deadly chemicals into the air that eventually make their way into ventilation systems and seat covers, not to mention the skin and eyes of passengers. That's reason enough to start pumping large doses of fresh air into aircraft cabins on a regular basis.

The timing is crucial. A new generation of aircraft making its way into the market with only half the ability of older planes to pump fresh air into the cabin environment. Soon, these newer aircraft will comprise the entire commercial aviation fleet. We should act on this legislation now while we still have a chance to affect the design standards for planes that haven't yet been built.

It's not like we can count on the FAA to promulgate a fresh air standard on its own. The agency is notoriously slow at implementing regulations that protect flying passengers and flight crews. After nearly twenty years, the FAA has still not drafted comprehensive regulations to implement the Occupational Health and Safety Act outside of the area of crash survivability. And while I commend Secretary Peña for taking action to inform passengers about insecticide spraying aboard international flights, I really question why our government hasn't done more to protect the health of U.S. citizens traveling abroad.

The debate here today should really prompt consumers and this committee to examine the larger issues at hand. Quite simply, when will the FAA stop dragging its feet and initiate health and safety regulations like its empowered to do? And when will the Congress enact legislation before scores of passengers and workers suffer harm or become ill? And when will the industry recognize it can provide a safe and health cabin environment and still stay in business?

The sooner we get started asking these questions, the sooner we'll find out.

Mr. OBERSTAR. Mr. Nadler.

TESTIMONY OF HON. JERROLD NADLER, A REPRESENTATIVE IN CONGRESS FROM NEW YORK

Mr. NADLER. Well, thank you, Mr. Chairman.

First, I want to thank you, sir, for holding this hearing on a matter of great importance to the health of the flying public. I appreciate the opportunity to testify today, and I look forward to working with you, Mr. Chairman, and with our colleagues on the Public Works Committee to address this significant public health problem.

Our colleague, Congressman Peter DeFazio, who has just testified, has been tireless in his commitment to protecting the health of the flying public; and I want to note and commend his work. To address the problem of contaminated air in airline cabins, I have introduced H.R. 2985, the Safe Cabin Air Quality Act with Congressman DeFazio, which would establish meaningful air quality standards for commercial aviation, twenty cubic feet of fresh air per minute per passenger.

It would also require the Federal Aviation Administration to closely monitor filter changing schedules and enforce current humidity and ozone standards which are notably not enforced.

Finally, it would establish an 800 number for airplane travelers and cabin crews to report air-travel-related illnesses which would be published and made available to the public—not with the names, obviously, but with the frequency.

The airline industry has repeatedly claimed that it provides healthful air quality in commercial airline cabins and that there is no need for the public or flight crews to be concerned and no need for Congress to act. In fact, just recently the Air Transport Association issued a report in which it purports to provide a scientific basis for its claim.

This position and this research is reminiscent of the tobacco barons who recently appeared before another congressional committee to say with straight faces that there is no proven link between cigarettes and cancer.

What the airlines—what the Air Transport Association has just stated is not what the scientific community is reporting; it is not what the people who work in airplanes are reporting, and it is not what our constituents are experiencing.

There is currently no legal standard for how much fresh air passengers are entitled to breathe during a flight. None. Commercial aviation in just two decades has gone from 100 percent fresh air in the cabin to an average of 50 percent fresh air every 7 to 10 minutes. The situation, Mr. Chairman, with the exception of eliminating cigarette smoke on flights less than 6 hours is not getting better; it is getting steadily worse. And again, in just two decades, we have gone from 100 percent fresh air in airplane cabins to an average of 50 percent fresh air every 7 to 10 minutes. That average means a lot of passenger cabins get less than 50 percent fresh air every 7 to 10 minutes, obviously.

Pilots have the ability, and some indeed have reported to have been pressured by management to use this ability, to close one or more of the airpacks on board, even all of them, to reduce, even further, the amount of fresh air available to passengers and crew.

Please remember, these changes in aircraft design and operation were not by chance. They were deliberately engineered as a cost-saving device. It has indeed saved the airlines money, but at a terrible cost to the flying public and to the crews.

We are not dealing here with some mysterious and poorly understood scientific issue. The American Society of Heating, Refrigerating and Air-Conditioning Engineers has established ventilation standards for buildings. These building standards are widely accepted and used in the design and construction of buildings. Yet while the construction industry is making progress in healthful building design, the airline industry is moving rapidly in the opposite direction.

I have been contacted by both frequent and occasional fliers from my district and from throughout the country who have reported a variety of ailments during and after their flights. I have spoken with flight attendants from a number of different airlines, all of whom have described experiences of being required to work in an unhealthful, poorly ventilated environment for long periods of time. They report impairments which could interfere with their ability to assist passengers in the event of an emergency.

One doctor from Denver, Colorado who specializes in respiratory ailments and who flies frequently wrote to inform me that a number of respiratory specialists at the 1993 Thoracic Society meeting in San Francisco concurred that there is a clear correlation between air travel and respiratory ailments. I understand that this committee has also received a large number of complaints from average Americans who have experienced similar ailments related to air travel.

But the committee need not rely on anecdotal evidence alone. A congressionally mandated study completed in the 1980s by the National Institute of Sciences concluded that when the ventilation systems currently in use are used at the rate of the ventilation system's lowest capacity with nearly a full passenger load, the cabin air quality meets the minimum air quality standards only if contaminant sources are not present.

That is quite an if. A planeload of strangers, animals in the cargo bays, thousands of flights per day, and no contaminants, no germs, no vapors from the baggage. What the Academy is really telling us is that in the real world, on real airplanes with real passengers, the air quality is currently substandard.

We need fresh air in airplanes, and if the industry insists on pinching pennies when it comes to public health, then Congress has an obligation to mandate minimum standards in order to safeguard public health and welfare.

A recent study by Harvard University further documents the level of contaminants in commercial airline cabins. This is not a figment of the imaginations of a few hypochondriacs. It is a fact which should concern everyone who flies today and everyone with the power to regulate the environment in which they fly.

Our constituents expect a safe and healthful air transportation system. At the very least, they have the right to the same air quality in the air that they get on the ground, and that is not asking much.

Just recently, this House imposed stringent restrictions on smoking in our own workplaces to ensure our own health and the health of our staffs. Airlines similarly ensure proper ventilation in the cockpits to protect the high-tech equipment in use there. I believe that our constituents are entitled to the same air quality as Congress and as in-flight computers.

I urge this committee to review the evidence carefully and to report legislation based on the facts and on the fundamental obligation of the Congress to protect public health, not merely corporate profits.

I appreciate this opportunity to testify and I look forward to working with the Members of this committee and with you, Mr. Chairman, to craft legislation which will finally address cabin air quality according to the best health-based standards. In that respect, I urge you to report the Safe Cabin Air Quality Act, or similar legislation which would enact strict standards for cabin air quality.

I would be pleased to answer any questions that you may have, and again, I thank you for the opportunity to testify.

Mr. OBERSTAR. Well, thank you both for a very thoughtful presentation and for the considerable work that each of you has invested in this subject in developing—not only developing a fine piece of legislation, but presenting some very substantial and persuasive evidence in support of that legislation.

A subsequent witness from the National Institutes of Health, the Centers for Disease Control, Dr. Hinman, will elaborate on a study that the National Institute of Occupational Sciences and Health, NIOSH—not N–I–E–S–H, but NIOSH—has inaugurated with the FAA, a 10-year study of the exposure risks to flight attendants of a whole range of issues—air pressure, tobacco smoke, ozone, changes in body rhythm—to determine what the effect is on the reproductive health of flight attendants.

That is a 10-year undertaking, and in questioning, I found that you can't go backwards and do this, you have to do it forward.

Are there any other similar studies that you think would be useful, the results of which could be obtained in a shorter period of time than the 10 years?

Mr. DEFAZIO. Well, Mr. Chairman, I think some—we had some discussion previously on the committee with—as I recall, with the National Academy of Sciences who had done several abbreviated monitoring studies of cabin air quality, and under conditions, you know, that were not—where the airline was obviously aware—and these were older-generation aircraft—of the ongoing monitoring, so that they could turn up the packs on those particular planes.

I would suggest a more comprehensive, realistic study of cabin air quality. They have these little devices that have had some monitoring done in my office which are apparently quite sophisticated, a small thing, about the size of a transistor radio, which apparently you could place in a couple of spots on the plane and, you know, without prior notification monitor air quality on a variety of aircraft in real-life situations and get a better handle on what exactly some of the contaminants are.

Mr. Nadler alluded to a few: chemical off gassing from toilets, inadequate evacuation of the ovens off of the plane as opposed to on-

board evacuation of the fumes from the ovens. And you know, I was on a plane just the other night and one flight attendant said, what is that? And the woman said, oh, it is the woman in row five who is doing her nails. You know, it was this rather acrid smell.

So real-life situations like that. I don't know what—acetone or whatever that is in nail polish, but it is not real fun to breathe.

So I would suggest that we could get the FAA to bring someone on board to do such a study in a fairly short period of time and at least find out what the contaminants are. Even if we don't know what the long-term health impacts of those contaminants are, we could begin to frame a way to reduce them on board. That is one suggestion.

Mr. NADLER. I want to make a careful point. Extra studies are always useful. But the time has come for action, and we should not defer strong legislative action, mandatory action now for further studies. We know enough to know that the air quality in cabins is not healthful, the self-aggrandizing study of the Air Transport Association to the contrary notwithstanding.

The Harvard study that was commissioned by the TV program 20/20 concluded that the environment of airplane passenger cabins presently poses a health risk to travellers. And I hope that we are not going to delay action, pending further study.

We have, Mr. Chairman, a developing epidemic of tuberculosis in this country, of strains of tuberculosis which are not susceptible to the antibiotics that have kept us safe for the last 50 years. We may be entering an era in which antibiotics will be less effective in fighting disease, because we have a new generation of germs that are resistant to everything we have. Hopefully, we will catch up with them scientifically, but we don't know.

Do we need airplanes that become tuberculosis breathing wards before we decide that we have to take steps to prevent that from happening? Do we need this environment to be a major vector? This is the next step, by the way. That is what is going to happen. Airplane cabins are going to become the next vector of disease transmission when we have airborne diseases, such as tuberculosis, which don't respond to treatment coming along.

So I hope no one is thinking of delaying strong action here, pending further studies, because we will have tragedies in the next 10 years if we do that.

We know enough to say that fresh air combined with recirculated air purifies to a large extent. We also know that no filter is foolproof, but we know that there are extremely effective filters that are used in hospitals which ought to be looked at for use in airplanes.

And again, we note that everyone emits bacteria. Some people, increasing numbers of people are going to be emitting tuberculosis bacteria because this is increasing in our society today. We have healthful air standards promulgated by the American Society of Heating, Refrigeration and Air-conditioning Engineers for buildings. Localities mandate those standards by law for new buildings. Most areas just do it without requiring a law.

We should enact standards for the air in airplane cabins at least as stringent as those required in the design of new buildings. Further studies are always in order, and I particularly commend the

Harvard study, but it should not precede strong legislation in this respect because the airlines haven't done it and the FAA has been recalcitrant. So it is up to us now.

Mr. OBERSTAR. Thank you very much. I will have some further questions later about the specifics of your legislation, and perhaps you want to elaborate on that during the question period later.

The gentleman from Tennessee.

Mr. DUNCAN. Thank you, Mr. Chairman.

Mr. Nadler, you mentioned that the fact that the airlines presently recirculate 50 percent of the air has meant substantial savings for the airlines. Have you done any cost analysis of this as to how much it would cost to have 100 percent fresh air? I understand it would make the engines less efficient, and I am just wondering what the cost would be. I am not saying it is bad to do this.

Mr. NADLER. Well, first of all, the legislation that Congressman DeFazio and I have introduced does not require 100 percent fresh air; it requires 20 cubic feet of fresh air per person per minute, which is not 100 percent.

Second of all, no, I have not done an analysis, nor do I think one is relevant. Frankly, whatever it costs to make sure that passengers are not endangered by flying in airplanes, that is the cost of the flight. And it is an inextricable cost to the flight; it ought to be regarded as such, just as much as the cost of the wing.

You wouldn't cut down on wing space and you wouldn't cut down on deicing procedures which save lives—to save money. It is exactly the same thing. You shouldn't cut down on the amount of air, fresh air, uncontaminated air that people need to breath. That is simply one of the uncontrollable costs of doing business.

There are controllable costs of doing business. You can control the elaborateness of the food you serve on the flight. Clean air, rather, should not be regarded as a controllable cost of doing business.

Mr. DEFAZIO. If I could, if the gentleman would—there are two issues, one is design standard and the other is operating standard, which we need to wrestle with here.

A concern that was raised in the hearing seven years ago was that we were about to design a generation of aircraft capable of providing fewer air changes per hour or per minute, however one wants to measure it. That is one concern. And we have got to address whether or not the current design standard approved by the FAA is adequate for this and future generations of aircraft.

But the second issue is, there is no operating standard. The FAA does not—you could have the spiffiest air exchange system in the world on board the plane. The airline is not obligated to operate it in any particular manner. It is pretty much up to the discretion of the pilot.

If you have ever been sitting back there, particularly in the old days—I have been in coach at times where you couldn't see, you know, more than five or six feet stuck in smoking, and particularly when I took my flight back here to get sworn in for Congress because they messed up my reservations. So I finally said, I can't breath, people around me were complaining, and the flight attendant very perkily said, oh, I will go ask the pilot to turn up the packs, and sure enough, in comes some more air.

Later, you could actually see 10 or 15 feet through the pall of smoke. That was an economic consideration, but there is no FAA standard. They didn't violate any standard by actually shutting the packs down or turning them way down.

So we need an operating standard and we need to scrutinize the design standard.

And just for my colleague who hasn't sat through some of these hearings, we actually do put a price on health and lives. We went through this on the exit row issue. We had put a certain price on the value of a human's life and decided that for a long time, when resisted by the Reagan and Bush administrations, complying with exit row capability was not warranted because of the price-benefit ratio until, you know, we pointed out I think rather vehemently to a number of cost-benefit analysts and people from the FAA that maybe if they were sitting in that seat, that they would put a higher value on their life when people were stacked up like cordwood, trying to get out of the exit which was blocked because of a seat which provided a few more revenue options.

And the bottom line here is, if everybody meets the same standard, no one is put to a competitive disadvantage. That is the key. Yes, it might cost more, but if everyone has to meet that standard, there is no competitive disadvantage.

For the good airlines, for the major airlines, for the good operators across a wide range of these issues, they want to provide more fresh air, they want to provide safer conditions and all of those things, but when they are pushed by the cut-rate operators, unfortunately, sometimes they do things they don't want to do.

So we need to set the standard here. We can't let it be set on an arbitrary basis or individually by the airlines or individually by pilots on every flight.

Mr. DUNCAN. Well, certainly improving the quality of air in these cabins is a goal that I strongly support, but I do think that we need to know how much these bills are going to cost, because you do—I would like to know how much this is going to increase the cost of airline tickets, if it is, and there is a witness later who says this can be done at zero cost. Do either of you agree with that?

Mr. NADLER. I don't know.

Mr. DEFAZIO. I will be intrigued to hear the testimony.

Mr. NADLER. It would be intriguing to hear the testimony. But again, I don't think——

Mr. DUNCAN. That is Professor Banzhaf from the Action on Smoking and Health, and he——

Mr. NADLER. He is certainly an authority.

Mr. DUNCAN. He says at one point that this can be accomplished at zero cost is what he puts in his testimony. He says—here is the part.

He says, "My purpose this morning is to advise you of what may well be, along with the risks of smoking sections, posed to flight attendants who must work amid the most dangerous health problem from polluted air existing on airlines today and the one which can be most easily corrected and at zero cost."

Mr. NADLER. Well, let me make one comment. I can't comment on Professor Banzhaf's testimony, except to say that he is an expert

in this field; and if he says it can be accomplished at zero cost, I would tend to accept that.

I would say one other thing, however. When looking at the cost and the cost impact on airline tickets, you also have to look at what the economists call the externalities. What are the medical costs imposed on society by not providing enough or properly clean air?

Mr. DUNCAN. Let me ask you on that, what is the medical cost imposed on society by this poor quality air in the cabin?

Mr. NADLER. Well, I don't know whether that has been quantified; but obviously if in fact we have contaminants, and we do— we have all of the evidence that we have of health effects, that it is going to be substantial, if only down the road in respiratory illness and in cancers and other illnesses, I would point out that the medical cost has got to go up. Because there is one great variable here that we haven't faced. That is, what I alluded to earlier, the medical background is changing.

We have all been used to a society for the last 60 years in which bacterial infections are totally controlled by antibiotics. That is changing, that is unfortunately changing, and we are going to have an increasing number of passengers flying in airplanes who are infected with bacterial diseases such as tuberculosis, with strains that are not susceptible to antibiotics, and they are going to be sneezing and coughing and breathing and spreading those germs, and you want those germs out of that cabin as quickly as possible, because otherwise you are going to have tremendous disease-spreading vectors and tremendous health costs.

Mr. DUNCAN. What specific evidence do you have, though? Do you have any studies or do you have any doctors who are saying that these illnesses have been caused by the quality of air in these cabins?

Mr. OBERSTAR. I would ask my colleague to be brief in the response. The gentleman's time has expired.

Mr. DEFAZIO. The CDC has done some studies which are not dispositive on this issue. They can point to some instances, particularly a plane that was grounded for some time, with the circulation system shut down, in Alaska where basically everyone became infected with influenza; and some other cases that are pretty definitive, unusual. For the most part, the studies are inconclusive, because there was no control factor: What were the people exposed to before they got on the plane; what were they exposed to after they got off the plane; what was their predisposition. I mean, those are control factors that are virtually impossible.

But in the cases of pesticides, there is also some much more definitive evidence in the case of the exposure to the pesticides, and there is extensive documentation on anaphylactic reactions, immune system reactions and other things which are well documented in reaction to these pesticides. And there have been some very serious cases which are very expensive, including a death attributed to spraying a pesticide on a passenger. So it varies.

Mr. OBERSTAR. The gentleman's time has expired.

The gentleman from Illinois.

Mr. LIPINSKI. Thank you, Mr. Chairman. I want to thank our colleagues for the knowledge that they have given us this morning. Obviously, they have really done their homework in regards to this

piece of legislation. I would like to try to solicit a little bit more out of them.

Has there ever been a time when commercial jet aircraft had 100 percent fresh air? Do either one of you have an answer to that?

Mr. DEFAZIO. I don't think that we could claim 100 percent fresh air at any point in pressurized aircraft. Probably the last time you could claim that would be flying a DC–3 at a low altitude. I mean, the older planes have a much higher capacity to change air and the cubic feet per second or per minute is much higher. But I don't think that one could call it 100 percent in a pressurized aircraft, although my colleague has a slightly different opinion.

Mr. LIPINSKI. Jerry.

Mr. NADLER. I would want to check that, but I am told that the first generation of jet aircraft had that capacity.

Mr. LIPINSKI. And it has been stated in your testimony, and I would also assume that the reason that it has been reduced is because it is more expensive to supply a greater amount of fresh air to a cabin?

Mr. NADLER. Well, because—yes.

Mr. LIPINSKI. Can you explain to me how you would supply or how the fresh air is supplied at the present time in the cabins?

Mr. NADLER. Well, I am not a technical expert on how you physically do that, but I believe you take fresh air in as the airplane flies, and then you put it through the filtering system, and then you circulate it. And the question is, how much fresh air you take in and circulate as opposed to recirculating the air. You are constantly taking air into and out of the cabin.

Mr. DEFAZIO. I can address it in—you have to bleed off of the engine and you have a compressor system, so you are basically dealing with high-altitude, low-oxygen air, you have to compress the air. You have to cool the air, because it comes off the engine at a high temperature, and then inject it into the cabin environment.

You would optimally also rehydrate the air, since it is generally very dry at high altitudes and the dehydration causes a whole different set of problems with people. To do this decreases engine efficiency, which increases fuel consumption, which is a cost.

That is the bottom line here, fuel consumption, and essentially drag on the engine. The newer generation of aircraft are designed differently and have less capability, even at optimal operating or at maximum operating capacity, to provide fresh air changes than the older generation of aircraft—again, mostly because of fuel inefficiency concerns.

Mr. NADLER. What we are really talking about is how much air you simply filter and then recirculate instead of bringing in a new batch. I suppose you would say, of fresh air to restart the process, in percentages and how often you do that.

Mr. LIPINSKI. I think you mentioned, Jerry, that the planes of the future have the capability of going to 100 percent recycled air. Is it your understanding or, Pete, is it your understanding that the airline industry plans on doing that?

Mr. NADLER. That is what we are told. That is what I am told.

Mr. DEFAZIO. Well, you could do—I mean, you can do that today. You can shut down the packs and just recycle the air that is within

the plane. I mean, that is an existing capability, not particularly desirable; and in effect, in providing air changes on the schedule that the newest, higher-flying generation of aircraft—57, 67, Airbus 300 and others—are doing, you are getting—you are moving in that direction. You are doing more recirculation.

It seems to me that there should be some trade-off here. If we are going to do more recirculation, then we may require a much higher standard of filtration than we do on the planes that basically bleed more air through the plane on an ongoing basis, but we haven't done that.

Again, the better operators change the filters very frequently, you know, but this is not a high priority at the FAA. They don't get on the planes to check the filters, and the other operators don't; and it becomes a competitive disadvantage for the better, more conscientious operators again.

Mr. NADLER. And that is why our legislation requires the FAA to closely monitor filter-changing schedules and to enforce humidity and ozone standards.

Let me add, if I may, one comment which I am told by staff since Mr. Duncan referred to Dr. Banzhaf's testimony with respect to zero cost. He was referring to zero cost of banning smoking on aircraft. He was not referring, I am told, to our bill about recirculating air.

Mr. LIPINSKI. Thank you, Mr. Chairman.

Thank you, gentlemen.

Mr. OBERSTAR. The gentleman's time has expired.

The gentleman from Michigan, Mr. Ehlers.

Mr. EHLERS. Thank you, Mr. Chairman. I wanted to raise an issue that hasn't been raised here at all.

Obviously, we want the cleanest air possible and if you talk about it in a vacuum, you know, we would agree with their statement we have to do something to clean it up. However, as with all environmental issues, this is a matter of balance. And we have talked about it here only in terms of extra costs.

The point is, it costs more because it uses more fuel. It uses more fuel because the engines use more fuel and produce more pollutants. So it is a balance between, what you are doing to produce other pollutants as compared to what you are doing for the inside air. I wanted to point that out because that is frequently overlooked in environmental issues. It is always a complex equation.

I have serious questions as to whether or not the inside of an airplane, the cabin is a disease vector as has been mentioned. I would—in doing a quick scan of the materials here, it also lists that as one of the least likely problems.

My personal experience, of course, is probably the same as yours, that the most polluted area one encounters is when you are on the ground, and particularly around airports where you get a lot of fuel fumes if you are following another plane. The deicing fumes, I find particularly offensive. Even though they shut down the circulation system at that point, there is still enough residue on the plane that when they turn the air back on, you get some very irritating fumes inside, and I suspect there is far greater danger from that and from following another plane and inhaling the exhaust than most other environmental factors inside the airplanes.

The other comment I would make is, if you are talking about 100 percent fresh air, I frankly am—I encountered more problems with that when they did that with the older 747s and so forth, because as you well know, there is very low humidity at high altitudes, that meant the humidity dropped very low because they tend to not carry amounts of water; and I experienced tremendous problems with a dry nose and throat in the early days of flying, which I don't experience now.

Mr. Chairman, all I am basically pointing out with these comments is that it is a far more complex issue that I have heard presented here, and perhaps because I have substantial allergy and respiratory problems, I have a different problem than most people who fly, although allergies seem to be becoming very prevalent. But I certainly have less of a problem now with irritation when I fly than I did 15 years ago when I first started flying at high altitudes, or 20 or 30 years ago.

So I just wanted to urge caution for the panel. It is a very, very complex environmental issue that is going to take a lot more study and analysis than I have heard mentioned here. I hope some of the further witnesses can explain this and give us some more of the facts of the situation.

Mr. OBERSTAR. Well, the subsequent papers to be presented are indeed very detailed and do address the subjects in the detail that the gentleman is seeking.

Mr. EHLERS. Thank you.

Mr. OBERSTAR. We are a long ways from the days of conveyors in northern Minnesota and northern Michigan when the aircraft would be sprayed and the cabin would be engulfed internally with this cloud of smoke and you couldn't see anybody even. We are not there any longer, nor will we return to that.

The gentleman from Louisiana, Mr. Hayes.

Mr. HAYES. I really don't want to hold up what will be a lengthy hearing except caution Peter DeFazio that 20/20 is really here to investigate his 1.3 million miles and could care less about air quality. And if the 1.3 million miles——

Mr. NADLER. Mr. Hayes, neither of us could hear what you said, although it was apparently pretty funny up there.

Mr. HAYES. I was just telling Peter that actually 20/20 is not reporting on his bill, they are here to investigate the 1.3 million miles that he has flown in the seven-and-a-half years he has been in Congress. Imagine, Peter—and I have flown about the same, so I guess they can investigate us both, while having the misfortune of returning to and from our districts, something that we should not have done during that seven-and-a-half-year period. But if you are like me, I would imagine if you are at 1.3 million, then your luggage ought to be right at the two-million-mile mark.

Mr. DEFAZIO. My luggage has been to some much more exotic destinations than my cross-country trips.

Mr. HAYES. They should really take a look at your luggage tags rather than your own flight schedule and they could really do a whale of a story on that.

Thanks very much.

Mr. DEFAZIO. Did the gentleman see—there was a cartoon—if I could, Mr. Chairman, just in response, which I have cut out and

placed in my office, which happens to be the bathroom, this one is about new cut-rate airlines and they have all of these options and it says, "Luggage, $1"; you know, "Luggage not sent to Guam, $500." Actually, they are doing much better with luggage, and I don't mean to denigrate the airlines.

Mr. OBERSTAR. Mr. Sangmeister.

Mr. SANGMEISTER. If they are doing better with luggage, maybe we ought to send them out to Denver and see what is happening.

I don't have much to comment on here, except that every day in the Congress there is always an enlightening thing. I have been here going on six years and I fly on United practically every weekend back and forth. Never once have I ever said to my wife, who usually accompanies me, "I will be glad to get off this plane, I can't breath well." Nor have I ever had a passenger come up to me and say, "Congressman, you ought to be looking into this, the air quality is so bad on these airplanes."

I am kind of surprised at what I am hearing here today.

Obviously, when you had the smoking, that was a big item. But after we got rid of that, I just don't see, as the other gentleman was indicating, that the air quality is that bad on the planes. But maybe I have something to learn. And I guess we have other witnesses that will tell us about it.

Mr. OBERSTAR. That is also a 50-minute flight. A little bit longer, but air time is only about 50 minutes, and it does make a difference on three and four hour flights.

Mr. SANGMEISTER. Well, when you sit on the ground for a half an hour, maybe on each side of that alone, those engines are still running and the cabin is still closed.

Mr. OBERSTAR. Mr. Laughlin.

Mr. LAUGHLIN. Thank you, Mr. Chairman, and I have to make the same observation that our colleague from Illinois just made. Mine are three-and-a-half-hour flights, and generally on those flights, people have gotten to know that I am a Member, and I have never had anyone in my almost six years of service complain about the air quality.

But be that as it may, there appears to be a lot of people on our schedule today that are going to tell us that the air quality is needing to be improved.

Peter—either you or Jerry—I would like to know, to meet the objectives of your bill, will redesign of the filter system, the ventilation system, the air system or the structure of the aircraft that are flown today be necessary?

Mr. DEFAZIO. It is my understanding that, no, the capability exists, although it requires some aircraft to be operated at maximum capacity in terms of air exchanges.

Mr. LAUGHLIN. The design capabilities are on the planes now to meet your objectives, is your understanding?

Mr. DEFAZIO. That is my understanding. We may hear testimony that might contradict that.

Mr. LAUGHLIN. One other area I would like to ask you about—and it may be that you can't answer it, and maybe other witnesses will be able to—but in the air quality evaluations, is any consideration given to the animal passengers in the cabin? And the reason I ask that, the last several flights I have been on, people have had

their pets on board; and I find that as objectionable as the smoking, and particularly a number of people have infants. And you know, there is a difference in putting up with an infant human being that is miserable because their ears are stopped up, or they don't like the cabin pressure, but it is a whole different set of circumstances having to listen to somebody's cat or dog yap and carry on the way they do.

And I just wonder if we are going to look at air quality, certainly the animal features on these airplanes ought to be considered also.

Mr. DEFAZIO. Well, I would address that in two ways. Certainly, it is discretionary on the part of the airline, whether or not persons are allowed to carry pets as on-board, in-cabin baggage or whether they have to be checked. So that is certainly a complaint or a suggestion that could be directed at the airlines.

Second, there have been other concerns. And a much publicized case—I believe it was in Texas where a dog was fried to death in the hold of an airplane, and the person only got reimbursed the value of luggage as opposed to the value of the loss of a loved pet. So there are concerns on both sides of the issue of transportation of pets, or animal companions, and certainly it warrants consideration on both sides.

Mr. NADLER. The only other comment I would make is that if pets are going to be permitted to travel in the cabin, it is not simply the noise an unhappy, or happy, pet may make. But the fact is that pets are living beings and they have their own sets of germs and other pathogens; and second of all, many people are allergic to the dander or to various types of animals, and that simply increases the necessity for rapid and adequate recirculation of air—or circulation of fresh air, I should say.

Mr. LAUGHLIN. Thank you. Jerry, those address some of the concerns I have about animals in the cabin, and as far as their safety is concerned, we have shipped our animals back and forth always in the hold of the plane, and they have survived; and as I understand, all the holds are pressurized so we don't have a problem there.

Mr. DEFAZIO. This was a problem of the plane sitting on the ground, very high temperatures and the dog becoming dehydrated and dying.

Mr. SANGMEISTER. Will the gentleman yield?

You now realize that your mail is going to increase, and I don't need to tell you from whom you are going to hear, right?

Mr. DEFAZIO. He just mentioned he owns pets.

Mr. LAUGHLIN. Yes. And they travel with us, but in the hold of the plane. Thank you, Mr. Chairman.

Mr. DEFAZIO. As pets travel, below deck.

Mr. OBERSTAR. The gentleman's time has expired.

The gentlelady from Missouri, Ms. Danner.

Ms. DANNER. Only in this committee would we get, Mr. Chairman, from the health of the flight attendants and others to the life and death of a dog. We are going to run out of time, so I will be very quick.

I do think that we have glossed over the fact that what concerns many of the people who are testifying here today is that, for example, smoking is still allowed on international flights. I see a lot of

heads bobbing in the back, because that is a real issue. Obviously, one's ability to fly international is based upon seniority, and so by the time you can get to the good flights, the international flights, you are also going into a smoke-filled environment after having flown domestically where you have no smoke-filled environment. So I think that is a very real issue.

And although it is quite obvious that many of us sitting at this table are commuters, weekly commuters to our respective home districts, we still do not put in the time that a flight attendant puts in in the aircraft; and I certainly can understand their concern about the environment they work in. I appreciate and hope I have an opportunity to hear them, because I think we are going into joint session in a manner of minutes almost.

Mr. OBERSTAR. The committee will continue its sitting. We will not recess.

Ms. DANNER. Very good. Thank you.

Thank you, Mr. Chairman.

Mr. OBERSTAR. Thank you very much. We greatly appreciate your presentation.

The gentleman from Michigan has an additional comment.

Mr. EHLERS. Just a comment, Mr. Chairman, since I did not use all of my time earlier.

I would certainly weigh heavy on the side of those who wish to ban smoking on international flights. I think that would be extremely important.

Secondly, in response to Mr. Sangmeister's comment, as I pointed out earlier, I think the greatest danger is on the ground and on—the runways on the ground are the ones that I think are the greatest threat to our health.

Finally, as an allergy sufferer—and my allergies to cats, on a scale of zero to 400, I ranked at 15,700, the highest my allergist had ever seen. Having a cat in the cabin is guaranteed misery for me; and I would certainly support prohibiting animals in the cabin itself. Thank you.

Mr. OBERSTAR. Well, for that issue I think the next panel is going to be the one that will provide at least some indicators of which direction to go.

Our next panel includes the Honorable Joseph P. Canny, Deputy Assistant Secretary for Domestic Policy at the Department of Transportation; Dr. Jon Jordan, Federal Air Surgeon at FAA; Dr. Alan Hinman, Director, National Center for Prevention Services, Centers for Disease Control; Mr. Thomas McSweeny, Director, Aircraft Certification Services at FAA; and Mr. Stephen Johnson, Acting Director, Registration Division, Office of Prevention, Pesticides and Toxic Substances at the U.S. Environmental Protection Agency.

We greatly appreciate your presentation this morning. I have read with great interest the scholarly documents prepared by each of you, and feel that they make an important contribution to the committee's understanding, and hopefully, to the public's understanding of the complexity of these issues.

One thing I want witnesses to keep in mind is that the number of exchanges per hour aboard aircraft, as compared to homes, the type of filter used aboard aircraft and the frequency of changes of

that filter and the adequacy of filters to remove substances from the air and the types of substances that can be in those, such as viruses that cannot be removed, and then the fact that air is taken from outside of an aircraft—as I was telling Mr. Duncan just recently, over at my district—80 degrees below zero at the altitude we were flying, heated to 80 degrees and then cooled back down to 75 degrees in the cabin, what does that do to quality of air and what effect does it have on substances in that air?

TESTIMONY OF HON. JOSEPH F. CANNY, DEPUTY ASSISTANT SECRETARY FOR TRANSPORTATION POLICY, U.S. DEPARTMENT OF TRANSPORTATION, ACCOMPANIED BY ARNOLD KONHEIM, SENIOR POLICY ANALYST, OFFICE OF THE SECRETARY OF TRANSPORTATION; DR. JON L. JORDAN, FEDERAL AIR SURGEON, FEDERAL AVIATION ADMINISTRATION; DR. ALAN R. HINMAN, DIRECTOR, NATIONAL CENTER FOR PREVENTION SERVICES, CENTERS OF DISEASE CONTROL AND PREVENTION (CDC), PUBLIC HEALTH SERVICE, U.S. DEPARTMENT OF HEATH AND HUMAN SERVICES; THOMAS McSWEENEY, DIRECTOR, AIRCRAFT CERTIFICATION SERVICE, FEDERAL AVIATION ADMINISTRATION; AND STEPHEN L. JOHNSON, ACTING DIRECTOR, REGISTRATION DIVISION, OFFICE OF PESTICIDE PROGRAMS, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. OBERSTAR. Mr. Canny, we will begin with you.

Mr. CANNY. Thank you, Mr. Chairman. It is a pleasure to be able to be here to discuss the administration's proposal for establishing an air traffic control corporation. Or is that a different hearing?

Mr. OBERSTAR. Excuse me. I was distracted a moment. I didn't hear what you said.

Mr. CANNY. You didn't want to hear it.

Mr. OBERSTAR. I just heard a familiar word there.

Mr. CANNY. It is a pleasure to be here to discuss the administration's proposal to establish an air traffic control corporation.

Mr. OBERSTAR. I think we will declare a mistrial.

Mr. CANNY. I am glad you laughed. One of my colleagues was wondering which way you would react.

Mr. Chairman, Members of the Committee, I am Joseph F. Canny, Deputy Assistant Secretary of Transportation for Transportation Policy. I am accompanied by Dr. Jon Jordan, the Federal Air Surgeon from the Federal Aviation administration, and Mr. Thomas McSweeney, who is the Director of FAA's Aircraft Certification Service.

Also with me is Mr. Arnold Konheim, who is a Senior Policy Analyst in the Office of the Secretary of Transportation who deals with these issues.

I want to begin by discussing two aspects of air cabin air quality that are directly managed by the Office of the Secretary of Transportation, smoking and insecticide spraying, or disinsection; and then Dr. Jordan will discuss other remaining air quality issues.

With respect to smoking, the goal of the Department of Transportation is smoke-free travel in all modes of public transportation. Over the past several years, we think that great progress has been made in fulfilling that goal. The one area in which we have been

focusing our efforts most recently is in the elimination of smoking on international flights.

In October 1992, the United States cosponsored and worked hard for the passage of a resolution by the assembly of the International Civil Aviation Organization to prohibit smoking on international flights. As passed, the resolution urges all ICAO member nations to take necessary measures as soon as possible to restrict smoking progressively on all international passenger flights with the objective of implementing complete smoking bans by July 1, 1996.

Because it is nonbinding, the ICAO resolution can be fulfilled only if nations acting alone or with others ban smoking. Therefore, shortly after the ICAO resolution was adopted, the Department of Transportation initiated a policy of entering into regional compacts to ban smoking through multilateral agreements.

In early 1993, the State Department granted us authority to try to negotiate such agreements, and we have proposed an agreement first with the Governments of Australia, Canada and New Zealand which have already expressed interest in prohibiting smoking on international operations into their airspace.

Negotiations are now in progress on that, and we think that the agreement will—if enacted, will go beyond enabling passengers and crews on the routes traveling these specific countries to travel without exposure to tobacco smoke. It could serve also as a catalyst for the creation of other regional compacts by demonstrating to the people and the air carriers of the world community that a smoking ban on international flights, including flights as much as 14 hours in duration, is not only feasible, but welcomed by passengers and crews.

Our efforts have not been limited to working with Canada, Australia and New Zealand, but we have also been contacting a number of other nations. Most recently, our initiative has shown success as a result of the statement last week by the Government of Jamaica by announcing that they have authorized continuation of negotiations with the U.S. and Canada with a view toward arriving at an agreement to ban smoking on all international flights between Jamaica and signatory nations.

Jamaica may not be viewed as a major destination, although it does have a lot of air travel from the U.S., but perhaps more importantly, the Jamaican cabinet recommended that Jamaica seek the support of the whole Caribbean community, the so-called CARICOM countries for this initiative with the view of having all CARICOM states be a part of the smoking ban. This is a very positive development, since operations to Canada and the 13 nations in the CARICOM community constitute about one-fourth of all U.S. international passenger flights. So we look forward to signing such an agreement soon.

I provide a little more detail on this in my written statement, and I think you have that at hand.

With respect to the insecticide or disinsection issue, that is an issue that has received increasing attention just within the past several months. The United States abandoned the practice some 15 years ago, as was noted in earlier discussion, because we had concerns about possible allergic reactions as well as concerns over the long-term health effects and questionable effectiveness of spraying.

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Recently, we became aware of public concern over the mandatory spraying in those countries that continue the practice. Travellers objected to being forced to be sprayed with an insecticide, the label of which warrants the product as hazardous to humans. The response of Secretary Peña has been to announce that the public will be notified of this requirement wherever it still applies, and that we will discourage its continued application.

Such notification of the public will permit individual travellers to consider alternate travel arrangements. In order to compile as accurate a list as we can of the countries that require disinsection, the State Department, through its embassies, last month delivered a letter from the Secretary of Transportation to the Ministers of Transport in every country that we deal with. We asked that they provide us information on whether they require disinsection, and also, we urged those nations that are continuing to spray while passengers and crews are on board to reconsider the practice and to spray only when passengers and crew are not present.

Our efforts are limited at this time, at least we anticipate that it will be limited to notification of passengers, because these other nations do have a right under the Chicago Convention to maintain disinsection where they deem it necessary for protection of public health or protection of agricultural industry.

That is a short summary, Mr. Chairman, of where we stand; and as I said, I can elaborate on any of this in response to concerns from you or questions from the other Members of the committee.

I would like at this point, if I might, to turn the discussion over to Dr. Jordan.

Mr. OBERSTAR. Dr. Jordan is our next witness.

Mr. JORDAN. Mr. Chairman, Members of the subcommittee, I know the issue of airliner cabin air quality is one of long-standing interest to the subcommittee, and I want to assure you that we in the FAA have taken seriously the concerns that have been raised about cabin air quality.

In response to these concerns, the Department of Transportation, DOT, has undertaken its own study, and we have carefully reviewed research conducted by others. All of the studies reviewed thus far—those conducted by the DOT, other governmental agencies, and the air carrier industry—have found no evidence of health problems with the air quality aboard air carrier aircraft, although the GEOMET study, as I will describe later, did identify a ban on smoking as a means of providing the greatest improvement in cabin air quality. All of the studies confirm to us that the air quality aboard an aircraft is at least as good as that commonly found in many other indoor workplaces or office environments.

In order to provide for the protection of air crews and passengers, the FAA has regulatory requirements to ensure that aircraft cabins are properly ventilated. Our regulations provide that each passenger and crew compartment must be suitably ventilated and they establish maximum allowable levels of carbon monoxide, carbon dioxide and ozone for crew and passenger compartments. We believe that these regulations are met in all current aircraft operations.

The FAA has recently proposed a rule change to further limit carbon dioxide in passenger cabin for newly certificated transport airplanes. That proposed rule was published on May 2, 1994.

I would like to take a moment to review with you the results of research that has been conducted to date on cabin air quality. In 1989, under contract with the Department of Transportation, GEOMET Technologies conducted a scientific study of airliner air quality. GEOMET monitored 92 randomly selected commercial flights in current aircraft types. Since the study included newer aircraft, which augment fresh air by recirculating filtered cabin air, the report's conclusions remain valid today.

GEOMET found that levels of ozone, biological aerosols and carbon monoxide were low in aircraft cabins. Carbon dioxide levels were somewhat higher than recommended for comfort, but well within the safety limits of the Occupational Safety and Health Administration's air quality standards. The study noted that a ban on smoking would provide the greatest improvement in cabin air quality, and subsequent Congressional and DOT action has resolved that concern for domestic flights. The GEOMET study documented that the cabin air quality showed no basis for medical concern.

In 1991, the National Institute for Occupational Safety and Health, NIOSH, in response to a request from the Association of Flight Attendants, investigated potential causes of headaches, dizziness, and other symptoms reported by flight attendants. NIOSH studied cabin air quality, measuring levels of carbon monoxide, ozone, carbon dioxide, nitrogen dioxide, oxygen, temperature, humidity and other factors. NIOSH found no evidence of an environmental or work-related cause for the symptoms reported.

The most recent study we have reviewed was released in April of this year by the Air Transport Association, ATA. This study of cabin air quality further demonstrated that the environment on board aircraft does not pose a health risk to airline passengers and crew. Our review of the study shows it to be thorough and statistically valid. ATA tested and monitored cabin air and other environmental qualities on 35 flights. The study included older aircraft using all fresh air circulation systems, as well as newer ones using partial recirculating systems.

The ATA study found that air particulate and contaminant levels, volatile organic compounds, and carbon dioxide levels all indicated adequate aircraft ventilation and posed no health risk. Biological contaminants were also found to be low, another indication of an efficient ventilation system.

The ATA study did find low humidity levels in cabin air due to the dry air brought into the aircraft at high altitudes. Dry air can be linked to complaints by passengers and crew about the cabin environment, since dehydration sometimes leads to symptoms such as sore throats and headaches. Air travellers can limit or eliminate these symptoms through increased consumption of fluids during flight.

While the air aboard an aircraft may be relatively dry due to the intake of little ambient water vapor at cruising altitudes, incoming fresh air is likely to be cleaner than that entering most indoor spaces on the ground. In addition, the dryness hinders the growth of many microorganisms that could cause potential health risks in cabin environments. Increasing the cabin's humidity level could create a moist, enclosed environment that would contribute to the

growth of mold, mildew, and fungus, as well as encourage aircraft corrosion.

Research indicates that commercial air travel poses no unique or significant risk to the health of passengers or crew. When compared to the air quality in many homes, office buildings, or other enclosed spaces where people congregate, the air quality in air carrier operations is satisfactory.

For those aircraft that recirculate air, the number of times air is exchanged ranges from approximately 10 to 20 times per hour. The average older home exchanges air once an hour, and the average office building exchanges air an estimated two to four times an hour.

As shown by the GEOMET and ATA studies, both of which included newer and older aircraft, the use of recirculated air in aircraft ventilation systems has no apparent health significance.

The Centers for Disease Control and Prevention, CDC, is investigating the possible transmission of communicable diseases such as tuberculosis on passenger aircraft. We have reviewed the published research conducted thus far on the aircraft cabin environment and have found no indication that cabin ventilation is a factor in spreading disease.

Disease is spread most often through personal contact, which can occur anywhere people congregate, such as in homes, schools, offices, theaters, trains, and passenger aircraft. Although there is anecdotal information about people developing upper respiratory infections after flights, we are not aware of any studies specifically identifying cabin ventilation as a factor in spreading disease. However, we encourage the research conducted by CDC, and CDC has been informed of our desire to participate in their studies.

In closing, Mr. Chairman, I would like to assure you that the FAA shares the concern for ensuring the air quality in air carriers is satisfactory for the health and safety of both passengers and crew. Studies that have been conducted to date show no evidence of any measurable risks under the current regulatory standards and airline practices. We continue to offer assistance and cooperation to the Centers for Disease Control in the investigation of areas of possible concern.

That completes my prepared statement, Mr. Chairman, and I or Mr. McSweeny would be pleased to respond to any questions you may have.

Mr. OBERSTAR. Thank you very much. I strongly encourage your continued participation and cooperation with the Centers for Disease Control and Prevention and other elements of NIH in this matter. I think the interagency participation and joint efforts are extremely important.

Dr. Hinman, we welcome your presentation this morning. I would like to compliment you on a very fine paper.

Mr. HINMAN. Thank you very much, Mr. Chairman, and members of the subcommittee, I am pleased to be here. I hope you will accept my statement in its entirety for the record. I will try to summarize some of the main points.

Mr. OBERSTAR. The Chair need not repeat all statements will be included in the record by unanimous consent.

Mr. HINMAN. CDC has been involved in several epidemiologic investigations of the possibility of transmission of airborne infectious diseases involving persons in aircraft. We have no evidence that air travel puts a person at a higher risk of contracting an infectious disease than other pursuits in which close contact with other potentially infectious individuals occurs such as train travel, attending school, or attending conferences.

Most recently, our involvement in the possibility of transmission of airborne infectious diseases in an aircraft cabin environment has been related to infectious tuberculosis. These investigations are important because available data on possible transmission of tuberculosis in the air cabin environment are extremely limited making it difficult for public health officials to accurately assess whether there is any increased risk of transmission among passengers.

Recently, CDC and several health departments in States have been involved in four epidemiologic investigations related to the possibility of transmission of tuberculosis on aircraft.

The first investigation involves a flight attendant diagnosed with active pulmonary tuberculosis in November 1992. After extensive investigation, analysis of data suggests that tuberculosis infection was transmitted to crew members who flew on aircraft with the attendant while she was sick. No crew member, however, developed active tuberculosis disease.

The risk of infection appears to be associated with exposure to the flight attendant over several flights and with increasing hours of exposure during flight. All crew members with positive tuberculin skin tests, which is the way we diagnose infection with tuberculosis, had at least 11.5 hours of flight time exposure to the flight attendant with tuberculosis.

Follow-up tuberculin skin testing was conducted to evaluate the risk of tuberculosis transmission to passengers. Because of difficulties in identifying exactly and locating passengers on particular flights, we used frequent flyer records to be able to identify persons who had been on flights with this attendant.

Of the 59 frequent flyers tested, four had positive skin tests. All of these had flown in October, the month just before the attendant was diagnosed with tuberculosis and the time she was presumably most contagious.

However, since these individuals did not have any record of previous tuberculin skin tests, it is not possible to determine whether they were infected by the attendant or whether they were infected at some time in the past.

The second investigation involved an international passenger with active tuberculosis on a flight that landed in Minnesota. The investigation which is now published concluded that, and I quote, "although the source case was considered highly infectious, results of this investigation did not demonstrate evidence of transmission."

The third investigation was initiated in April 1993 and involved an international passenger who was diagnosed with active tuberculosis within a week of arrival in the United States.

Epidemiologic data in this investigation suggest that the positive skin tests and apparent skin test conversions found among passengers and crew were probably due to a boosted immune response

from prior BCG vaccination or prior exposure to tuberculosis, but it is difficult to be certain.

The fourth investigation involved an international passenger who was found to have active tuberculosis upon arrival in San Francisco in March 1993.

There was no evidence of transmission of tuberculosis on this flight, although some passengers did have positive skin tests.

With respect to other issues, as you heard, we undertook a study at the request of the Flight Attendants Association a few years ago and in fiscal 1991, the National Institute for Occupational Safety and Health and the FAA began designing a 10-year study of the effect of exposures in the aircraft cabin on the reproductive health of female flight attendants. This project will include three studies, a pregnancy outcome study, an ovulatory outcome study and an early pregnancy loss study. Initial feasibility studies are currently under way.

With respect to disinsection, during the late 1930s, the Public Health Service instituted insecticide spraying or disinsection requirements to include all aircraft arriving at any U.S. port from an area infected with any vector-borne communicable disease. In 1979, we amended the foreign quarantine regulations to discontinue the requirement for routine spraying because of concerns for the health of passengers and crew, the lack of evidence that aircraft spraying played a significant role in disease control, and the belief that discontinuation of spraying would not present a significant public health threat.

Conversely, the spraying caused discomfort to many passengers and had the potential for creating acute allergic reactions, asthma attacks, and other allergic or respiratory responses in certain passengers. Since routine spraying of aircraft was discontinued in the United States in 1979, there have been no outbreaks of vector-borne disease in this country that can be attributed to imported vectors.

Finally, I must mention the continuing problem of smoking on international flights. As you know, legislation was passed in 1990 to ban smoking on all domestic flights of six hours or less which applies to approximately 99 percent of all U.S. flights.

No such legislation, however, applies to international flights, although several airlines have voluntarily imposed additional restrictions including smoke-free international flights.

In October 1992, as you have heard, the International Civil Aviation Organization adopted a resolution calling for smoke-free flights by July 1, 1996. It is our hope that this will culminate in a general policy prohibiting smoking on all commercial airline flights worldwide.

In conclusion, I would say that we have no data to indicate an increased risk of transmission of infectious airborne diseases among passengers in an airplane as compared to persons in any other confined environment.

Suggestive evidence exists of the possibility of tuberculosis transmission among flight crew members, although this transmission could have occurred on the ground.

Mr. Chairman, this concludes my formal statement. I will be pleased to try to respond to any questions you may have.

Mr. OBERSTAR. We will have some questions. Thank you very much, Dr. Hinman.

Mr. Johnson, welcome. Glad to have you with us this morning.

Mr. JOHNSON. Thank you, Mr. Chairman. In my remarks this morning, I would like to summarize EPA's current activities to reduce reliance on use of pesticide products in quarantine programs and to better protect the health of U.S. citizens traveling on airplanes from the risks posed by pesticides.

I, too, would like to submit my formal written statement for the hearing record.

EPA's role in this area involves our responsibilities under the Federal Insecticide, Fungicide, and Rodenticide Act, to license or register pesticides to be sold in the U.S.

The pesticides used in the quarantine programs in the U.S. must be registered by EPA and applied in a manner which is consistent with the products approved labeling. In mid-1979, EPA registered a pesticide, sumithrin, for use in cabin areas when passengers and crew were present.

As has been described in statements earlier this morning, several countries require the cabin area of incoming airplanes to be treated with an insecticide while passengers and crew are on-board.

EPA believes that this use of pesticides results in the unnecessary exposure of passengers. Our concern over this practice has resulted in activity in our agency on three separate tracks. First, EPA is working tc better understand the implications for public health of exposure to in-flight sprays and to strengthen the labeling of pesticides that may be used on airplanes. EPA is aware that approximately six people were reported to have had an adverse reaction following exposure to in-flight sprays.

Second, EPA is assisting in efforts intended to inform other governments about U.S. experience with the use of pesticides in quarantine programs.

Finally, EPA also supports the development of an appropriate mechanism for informing passengers about in-flight pesticide treatment before it occurs.

I would like to briefly review each of these three areas.

Regarding the health concerns, in early 1993, EPA became aware of several incidents in which airline personnel and passengers experienced adverse reactions after being exposed to an in-flight pesticide treatment. The reported health symptoms associated with the spray ranged from headaches and nausea to more severe cases in which seizures and memory loss were to have occurred.

The pesticide that may have been associated with these reported adverse reactions is the sumithrin product registered for in-flight use. Sumithrin belongs to a class of chemical compounds known as synthetic pyrethroids that is generally known to be low in toxicity to humans. However, EPA is working now with the manufacturers of the sumithrin products to obtain additional toxicity data on the pesticide.

This information will enable us to better understand the toxicological properties of the pesticide and determine if its use practice provides for an adequate margin of safety for all subpopulations. The companies have until mid-June of this year to indicate whether they intend to develop the required data. EPA is also

working with the manufacturers to develop a new label for this product that is both appropriate and protective.

For example, the labeling of one of these sumithrin products contains a warning statement which advises against exposing the product to skin or breathing the products vapors. At the same time, the directions for use state that the treatment should take place 30 minutes prior to landing and that ventilation systems should be turned off while the cabin is sprayed. In light of this use pattern, however, it is impossible to prevent dermal or inhalation exposures during an in-flight cabin infliction.

This second area involves information sharing with other governments. EPA is working with the Department of Transportation and the Department of State to inform other governments about U.S. concerns raised by in-flight spraying.

EPA assisted in the development of a diplomatic cable transmitted to all foreign ministers of transportation on April 16. The cable indicated that the U.S. no longer requires in-flight spraying and that the U.S. Government was concerned about several incidents in which individuals reported experiencing adverse reaction to the exposure. EPA is available to provide technical assistance to the committee or to the Department of Transportation in discussing this issue with other governments.

The third major area involves passenger notification. EPA believes that passengers have a right to know about the treatment before they step on to an airplane. The pesticide applications may occur now without any advance notification to passengers. EPA supports the development of a mechanism to notify passengers at the time the ticket is issued.

In conclusion, EPA's strategy for resolving this problem involves four key elements: First, efforts to better understand the potential health effects of exposure to this in-flight spray; second, activity to strengthen the product labeling for pesticides that are used on airplanes; third, opportunities to share technical information about U.S. concerns for this practice with other governments; and finally, fourth, development of a mechanism to notify passengers before they are exposed.

That concludes my statement, Mr. Chairman. I would be happy to take any questions that you or the subcommittee may have.

Thank you.

Mr. OBERSTAR. Thank you very much, Mr. Johnson. Again, thanks to all the panel.

Let me begin, Mr. Canny, with the NPRM that was initiated in 1989 on air quality standards. It seems to me five years is a sufficient time for this NPRM to have matured. I know it was on another administration's watch that it was started, but you folks have been in camp now for quite awhile and have had an opportunity to look at this.

Don't you think it is time to revisit that NPRM and move the process along, get it completed, updated, upgraded and make it a rule making?

Mr. CANNY. I apologize, Mr. Chairman. I am not sure precisely what NPRM this is.

Mr. OBERSTAR. Air quality.

Mr. CANNY. On airline cabin quality, an FAA standard?

Mr. OBERSTAR. Air flow standards, yes.

Mr. CANNY. Let me ask Dr. Jordan to respond.

Mr. JORDAN. I will ask Mr. McSweeny to respond, since this is in his area.

Mr. OBERSTAR. Move this right along, okay? If you took some folks of the privatization study and put them on this project, you will have it done a lot quicker. Priorities, I guess.

Mr. MCSWEENY. Touche. That particular NPRM, if it is the one I am thinking of, deals with high altitude operation of aircraft and does in fact have some criteria in there for increased air flow. That increased air flow is not in there for cabin safety matters, but for matters of purging of smoke should there be an on-board fire.

It certainly would have some benefits of increased air flow but that was not the primary reason for the NPRM.

Mr. OBERSTAR. There was a lot of feeling it would benefit cabin air quality if that NPRM were okay, too.

Mr. MCSWEENY. It basically would require an equivalent to 10 cubic feet per minute fresh air per passenger, which I might add is approximately the lowest value that exists right now on any aircraft. Whether it would of——

Mr. OBERSTAR. 10 cubic feet per passenger.

Mr. MCSWEENY. Per passenger per minute. So whether it would have a real impact, I think, is kind of up for discussion.

We are presently working on the final rule on that, and doing the appropriate analysis that needs to be done.

Mr. OBERSTAR. How many exchanges of air are there per hour in the average home?

Mr. JORDAN. In the average home, as I testified in my prepared statement, there is approximately one per hour. It could be less.

Mr. OBERSTAR. And aboard an aircraft, it is a significantly larger number of exchanges?

Mr. JORDAN. Significantly, yes, from 10 to approximately 30.

Mr. OBERSTAR. Ten to 30 exchanges per hour?

Mr. JORDAN. Yes.

Mr. OBERSTAR. Then the next question is: The air is being exchanged through the filters, as I understand the research I have done in this subject, which are hospital type filters .5 micron. That is a fairly small hole through which very little can pass. A micron is an extremely small unit of measurement. The question is, A, is that size adequate and, B, are the filter exchange requirements sufficient; that is, are filters being changed often enough on-board aircraft to remove—to be sure that they are capable of removing substances aboard aircraft?

Mr. MCSWEENY. Let me deal with that if I might.

As far as the capability of the filter, they are the best out there presently being used in the hospital environment. The small size of particles captured by the filters certainly covers most things we would want to capture.

Those filters are—there is a recommended exchange time for them. They cannot be cleaned, they must be removed and replaced.

That exchange time presently corresponds to what we call a maintenance C-check for an airline; anywhere from 3,000 to 5,000 flight hours.

The interesting thing about these HEPA filters is that as they capture particles they in fact become more efficient because they are able to stop more future particles from transversing the filter because part of the passages are blocked. So they really become more efficient as they become older.

Mr. OBERSTAR. I will have further questions later. I want to go to other Members to give them an opportunity.

The gentleman from Tennessee.

Mr. DUNCAN. Dr. Jordan, you are listed as the Federal air surgeon for the FAA.

Mr. JORDAN. Yes.

Mr. DUNCAN. In your position, is it your responsibility to try to correct any health-related problems that you find being caused by——

Mr. JORDAN. I certainly attempt to facilitate the correction of any problems that may occur that are health related.

Mr. DUNCAN. I assume from your testimony that you would agree with this statement by Dr. Hinman when he says, we have no evidence that air travel puts a person at higher risk of contracting an infectious disease than other pursuits which have close contact with other potentially infections and individuals occurs.

Mr. JORDAN. Yes, sir, I agree with that.

Mr. DUNCAN. You mentioned in your testimony the ATA study of April of this year, and you say this study of cabin air quality further demonstrated that the environment on-board aircraft does not pose a health risk to airline passengers and crew, and you say our review of the study shows it to be a thorough and statistically valid study.

Do you have any connection with the Air Transport Association or any airline, or is there any reason at all that you would have to alter your testimony in any way? In other words, if you thought the air quality in these airplane cabins was dangerous to passengers, would you tell us?

Mr. JORDAN. If I thought it was dangerous, I would certainly tell you, yes, sir.

Mr. DUNCAN. Do you think it is fair or accurate to link a worldwide outbreak of tuberculosis with the quality of the air in airplane cabins as an earlier witness did?

Mr. JORDAN. Well, I think Dr. Hinman might explain a little bit better perhaps what he said in his prepared statement.

Mr. DUNCAN. I am not talking about Dr. Hinman, I am talking about one of our colleagues, Congressman Nadler implied or inferred that this worldwide outbreak of tuberculosis could be engendered or the incidence would at least be increased due to the poor quality of air in airplane cabins.

Mr. JORDAN. No. I don't believe that the quality of air in the cabin would have an influence on that.

I think what might have an influence on it is the fact that we have large numbers of people being transported in a relatively small enclosed area. The risks that you would encounter in a situation like that are no different from the risks that you would encounter in any other situation where a large number of people get together.

The one thing about air travel is it does take people from State to State and from country to country, and there is the opportunity of course for disease transmission simply because of that.

Mr. DUNCAN. The bill before us requires that there be a minimum amount of humidity in the aircraft, however some aircraft manufacturers say that higher humidity levels on aircraft would breed unhealthful bacteria and would lead to—could lead to corrosion.

Do you agree with that or do you think that that is a potential problem that, if we increased the humidity levels in the planes, that we could be creating other harmful bacteria?

Mr. JORDAN. Oh, yes, I agree with that totally. The higher the humidity, the more likely you are to have a replication of bacteria that feed on humidity as well as fungi and molds and other types like that. The drier the air, the less likely you will be to have that sort of thing happen.

Mr. DUNCAN. ABC News had a special on two or three weeks ago by John Stossel, and the title of the program was "are we scaring ourselves to death?"

His point throughout that program repeatedly was that, in past years, we have overreacted to scare type headlines and have spent many, many billions in correcting problems of which there was almost just minuscule type risks, and that in doing so, we have decreased employment and have created poverty and that poverty has led to shorter lives, much more so than would the risks that we were trying to correct.

Is there anyone on the panel who thinks that air passengers or crews should be scared because of the quality of air in airplane cabins today?

Mr. CANNY. I will answer that. I think my medical colleagues perhaps are more qualified in one sense to do it, but I think it is very clear that the residual environmental tobacco smoke situation that we find on international flights is a legitimate health concern.

The study that we did in the late 1980s that Dr. Jordan described in his testimony did give us some general statistical assessment that there would be excess mortality levels associated with the levels of environmental tobacco smoke that were observed at that time. That is legitimate concern.

Mr. DUNCAN. Let me say, I am about as anti-smoking as anybody could get, and I voted to ban smoking on the airlines and I am in favor of that, but I am talking about going—I think that is pretty well settled.

Is there anything else now that you think that when we travel on the airplanes frequently we should be scared about?

Mr. CANNY. Not in my judgment. But, again, perhaps Dr. Jordan and Dr. Hinman could respond.

Mr. JORDAN. My answer is no.

Mr. HINMAN. If I could——

Mr. DUNCAN. Yes.

Mr. HINMAN. Congressman, I think the potential for severe reactions to insecticides, sprayed inside planes, is one thing that I think one could legitimately be concerned about. Beyond that and tobacco, I don't think there is a reason to be scared about the quality of air in planes.

Mr. DUNCAN. Basically the air in these cabins is basically—there are harmful particles in the area anyplace that we go; is that correct? Inside or outside? Basically the air in these airplane cabins is about the same as it would be in any other place where a lot of people are congregated; is that fair to say?

Mr. HINMAN. I think in terms of infectious disease transmission risk, that is fair. There are some differences as have been alluded to. The humidity is clearly lower in airplanes than it is in most other places. But, generally speaking, I spend a fair amount of time on airplanes myself and I am not scared about the quality of the air.

Mr. DUNCAN. Thank you very much.

Mr. OBERSTAR. The gentleman's time has expired.

The gentleman from Oregon, Mr. DeFazio.

Mr. DEFAZIO. I thank the Chairman.

I guess, first, I would go to the last remark by the gentleman, Mr. Duncan.

I would be happy to come over and spray him with this if you want to talk about fear. This is a related substance—I couldn't get any Black Flag locally, perhaps they pulled it—but this is a similar substance. It is an ant and roach killer. If you gentlemen would like, I would spray him with it. If the gentlemen down there want, I would spray them with it, and they could tell me they don't fear it, they enjoy it. That is one.

That is obviously the extreme.

But we are subjecting millions of Americans to that. I would defy anybody on this panel to support spraying people with a substance that is clearly labeled it is not supposed to touch your skin, it is not supposed to touch your eyes, it is not supposed to touch your nasal membranes, you are not supposed to inhale it, you should evacuate the area, the area should be ventilated.

We are spraying that.

Yes, people should be scared about that.

That is an extreme.

If anybody wants to refute that?

OK.

Let's go to the less extreme examples.

I am puzzled as to why we have a regulatory agency that doesn't regulate. Now, I would like to know why the FAA has such a vague standard for operations. The key is, you have these tests, its great, you have the tests.

What kind of planes? Where on the planes? What kind of conditions? Were the packs operating or not operating? Were the recirculating fans operating or not operating? At what percent of capacity? You got the tests. Great.

Excuse me, airline, we are going to be on testing your air quality. Pilot, turn up the packs all the way.

OK?

What about on a flight where they don't turn up the packs all the way? Why don't we have standards saying with this passenger load, you should operate at this percent of design capability. Why do we have such vague standards? Why don't we have an operating standards? Why do we leave it up to the airline? Why do we have

memos from the airline saying, if passengers complain, turn on the packs, turn up the packs, but don't do that otherwise?

And I have been asked about the cogs. I have two costs in the memos before me that range from about $1 per passenger per year for maximum operation on an A–320 to 60 cents per passenger per year for maximum operation on a Boeing 747 versus 50 percent.

Now, is that too much? Do you think the American public doesn't want to pay 60 cents or a buck per passenger per flight to have a good operating standard?

Tell me. Why doesn't the regulatory agency regulate? Why don't you have an operating standard? Why? Pressure from the industry? Or you just don't think it is necessary? You think it should be up to the individual pilot on the individual flight to make a determination?

We have these memos before us, when passengers complain, give them some air.

You told us the optimal circumstance. The air is pretty good when it is all being operated, but we are not controlling the operations. How the hell can you say these studies are valid?

Mr. McSWEENY. Let me try to respond.

Mr. DEFAZIO. Unless you require operation.

Go ahead.

Mr. McSWEENY. You are absolutely correct. There are no requirements in the operating rules that the packs be operated in a certain manner. Certainly, though, there is a requirement, and it was alluded to earlier, that the pilots could turn off the air conditioning. That is clearly not possible except in an emergency because there are several rules that require the air conditioning system to be on.

I think there is a lot of confusion over what the pilot actually is free to do. Many of the new systems are in fact either on or off. Many of the systems that are in new airplanes like the 747–400 and the new 737, and airplanes like that, cannot be defeated by the pilot except for turning off a circuit breaker which is a pretty drastic action. If one of those packs, for instance, fails, the other packs will automatically go to a higher flow.

So there are a lot of rumors about packs being turned off and packs being turned on. I think maybe the manufacturers of the airplanes who will be on a later panel might be able to elaborate more on this specific design and what the pilots can and cannot do.

Mr. DEFAZIO. I have memos again relating to A–320s and 747s, doesn't say if it is a 400 model, which relate to turning on or off individual packs which would seem to confirm your statement. In any case, there are significant numbers of airplanes not having these, so there is much more latitude in terms of operation. Would you admit that some large percentage of the fleet has much more discretion in terms of on or off?

Mr. McSWEENY. There is a percentage of the fleet that has that discretion, yes, you are correct.

Mr. DEFAZIO. How about a performance standard. I raised in my initial testimony the issue that, at your regulating agency, we found you don't have an operating standard; how about a design and performance standard? What is the design and performance standard for the new generation of aircraft if they are just on or off? What must they be able to deliver in the on position?

Mr. McSWEENY. In the on position, the performance standards basically talk about adequate ventilation.

Mr. DEFAZIO. Adequate? How many cubic feet per minute or second is that?

Mr. McSWEENY. We do not have performance standards for design of the aircraft that specify an amount of ventilation per minute.

Mr. DEFAZIO. So it is in the mind of the beholder. Given the few substances you are occasionally testing for, CO_2 and others. Adequate is in the mind of the manufacturer or the engineer or whomever? Or the airline putting pressure on the manufacturer to provide a more fuel-efficient aircraft?

That is a heck of a position for a regulatory agency.

Do you think we should go to that standard for buildings? Would that be good, just say adequate, we are not going to have NIOSH or anybody in there anymore, just adequate? You provide an adequate amount of air interchanges, provide adequate work space, adequate space for disabled people. That would be a great standard for the Federal Government to adopt that. Be a field day for lawyers, I guess.

I can't believe a regulatory agency has been wrestling with this for 20 years in terms of the OSHA standards and we still don't have any and we say adequate.

I mean, I am a little impatient with you because you are not— I have been here 7.5 years and there have been six or seven panels of FAA apologists up here telling me we would have standards soon, Congressman; I've never seen them.

Are you going to develop more specific either design or operating standards? Do you have any intention of doing that within the agency? Is there anything in process other than the CO_2 rule pending?

Mr. McSWEENY. Other than the CO_2 rule and the rule that Chairman Oberstar asked the question earlier about, we have no regulatory action pending.

Mr. DEFAZIO. You are a dream regulator. I think there are a lot of industries who would like to be regulated in the same way. The agricultural industry would be interested in hearing, provide adequate ventilation and adequate control of cotton dust and fibers. It certainly would relieve the industry of a lot of regulatory burden.

I am of the opinion that if after 20 years you can't promulgate a workplace health and safety rule, that you ought to lose your exemption. I hope we can provide that in the OSHA regulations later this year because you clearly have no inclination to use the authority which you have been given in good faith by the Federal Government, by other parts of the Federal Government.

I thank the Chairman.

Mr. OBERSTAR. The gentleman from Texas, Mr. Laughlin.

Mr. LAUGHLIN. Thank you, Mr. Chairman.

I was brand new on the committee when we took up cigarette smoking on the aircraft and was one of those that voted against the Chairman in his position and he has never let me forget that.

Mr. OBERSTAR. That is right.

Mr. LAUGHLIN. My reason for doing it is, I arrived here and learned this government had just spent what sounded then like a

large sum of money to fund a study by, I believe, the American Academy of Scientists to study air quality on airplanes which was going to include more than cigarette smoke.

Later, the cigarette smoking was banned on the airplanes and I have never heard in the next five years anything about this study about air quality and the scientific academic study. Can any of you shed any light on what happened to that study and if it was ever finalized if it showed that air quality and the airplane cabin contained any contaminants that were harmful or uncomfortable or distressful to the passenger other than cigarette smoke.

Mr. JORDAN. Yes, sir. I think I can respond to that. The National Academy of Sciences report was followed by the GEOMET study which I referred to in my presentation. In that study, a number of aircraft were evaluated in terms of the air quality, including not only the older generation aircraft, but the newer generation aircraft. That study concluded there were no significant health risks in relationship to the cabin quality, irrespective of the type of aircraft.

That report was issued in 1989.

Mr. LAUGHLIN. Shortly after our vote, then?

Mr. CANNY. Shortly before congressional action banning——

Mr. LAUGHLIN. I am talking about the committee vote. It could be that is why we didn't hear anything. As I understand, you are saying the study showed there were no other contaminants in the cabin area that were cause for health problems to the traveling passengers; is that correct?

Mr. JORDAN. Yes, sir, that is correct.

Mr. LAUGHLIN. Now, in some of the statements we have had and testimony, it talks about smoking on international flights. I don't smoke, never have. Frankly, I don't care whether other people do other than I think it is very harmful to their health and would make ads stating that position.

But how do you address what international carriers do? Do we put a ban on them coming into the United States? Do we take other action to get their attention other than American passengers or people that don't want to smoke deciding not to go get on brand X that will allow smoking?

I give you a case in point, all of us on this side of the table can relate to what happens in our district or what we know about personally. Last summer, I must confess, I used bad judgment and allowed my son to fly on Aeroflot to Ireland and when he got back—and I must also say that if I had known about all these other air crashes that were taking place, I wouldn't have done that. But be that as it may, his only comment about his Aeroflot flight to Ireland and back—I have got to clarify, it is the only nonstop between Washington, D.C. and Ireland where he was going to visit—was all the smoke on the plane.

He is not a smoker and he is accustomed to flying quite a bit with me and he had great criticism of all the smoke on this Russian airliner. How do you all address it over at the FAA?

Mr. CANNY. If I may, Mr. Laughlin, we are trying to address it through the International Civil Aviation Organization which is the international group under which all national aviation agencies such as our FAA get together and establish guidelines and rules.

We have successfully encouraged adoption of a resolution at ICAO which encourages all nations to ban smoking on international flights by 1996.

We are working, as I indicated in my testimony, to try to negotiate bilateral and multilateral agreements with our aviation partners to begin to implement that and we hope that it will set up a cooperative atmosphere and will lead to a domino effect whereby other countries will join in and participate in this ban.

We expect to have some agreements in place in the fairly near future and we are getting inquiries from a number of other countries about what they can do and how they can participate and be a part of this.

Mr. LAUGHLIN. How optimistic are you that that would really work? Take into consideration the smoking environment in some of the countries in the Middle East. I was in the Army long enough ago that we had smoke breaks and that was a culture that we had in this country.

That pales by comparison to a lot of the Middle East countries particularly Turkey and the Turkish Russians of the former Soviet Union where I have traveled so much and my experience in Europe. How do you expect these cultures where smoking is so dominant in the day-to-day activities?

Mr. CANNY. I think it is legitimate to ask whether we are going to get 100 percent compliance by 1996. That is perhaps an unrealistic goal, but we think we can make real progress. Again, as indicated, we are working with Canada, and the Caribbean nations, and those destinations together account for approximately 25 percent of all international operations out of the United States.

So if we can have in place an agreement that will cover 25 percent of the international flights this year, that is real progress. We think we can build on that. We are working—and our airlines are moving ahead, by the way. They are offering some international flights that are smoke-free. So progress is on a step-by-step, incremental basis, but we think we will ultimately be quite successful.

Mr. LAUGHLIN. Well, most of these international airlines are government owned. I have got two questions there. Are the governments that own these airplanes, airlines, are they at the negotiating table? Are they showing any sensitivity to banning smoking on international flights? What do you do with the airlines—and I have been in the cockpit of several of the international planes where smoking takes place by the flight crew as the plane is in operation.

Mr. CANNY. With respect to the first question, yes we have been working with the governments. In fact, essentially what we have been doing is a government-to-government negotiation, not airline-to-airline.

With respect to smoking in the cockpits, there was some indication in the past that, a concern that nicotine withdrawal symptoms on the part of pilots who were accustomed to smoking and then were told they could not smoke while in the cockpit might have adverse effect on their performance. I think more recent studies in that area have indicated otherwise, and, in general, smoking in the cockpit is either prohibited or at least it is not very common now.

Maybe Mr. Jordan would like to comment on that more specifically.

Mr. JORDAN. Yes, I think that I can.

The previous study that was referred to was a study done by the Public Health Service approximately 12 or 15 years ago regarding a proposal or a suggestion that we should ban smoking on the flight deck.

The group that was put together by the Public Health Service came back to the agency with an expression of concern about an adverse safety impact from banning smoking on the flight deck. For that reason, we did not proceed with any kind of regulatory action at that time.

We have continued to have an interest in this area, however, and have been able to organize a group of experts in a process that is being led by CDC to look again at the question of potential adverse safety effects from banning smoking on the flight deck.

We have not yet received a report from that group. It is in a draft stage and I expect to have it within 30 to 60 days.

Mr. LAUGHLIN. Next, I want to ask the Director of Aircraft Certification Services, Mr. McSweeny; I noticed sitting near the bulkhead occasionally on an older aircraft you really get a chemical odor out of the rest room. I know most ages of the aircraft and I am not a pilot, not an aeronautical engineer, but what are you all doing about that?

I see some flight attendant representatives out there nodding their heads and my expertise is only from sitting there occasionally.

Mr. MCSWEENY. The older lavatories are certainly of a lot different design than the present lavatories.

Mr. LAUGHLIN. Can't that be fixed?

Mr. MCSWEENY. Yes, it probably can be fixed. I wouldn't deny that.

Present designs, though, which are finding their way into even the older aircraft that are being refurbished, are more of a one-piece unit molded together with a lot more positive air flow down and out than they have had in the past. The design by the manufacturers now tends to draw the air down to the floor and out overboard and increases the air flow a little bit in the lavatories to keep that odor in that local area and then out.

Mr. LAUGHLIN. It seems to me, if the FAA were really concerned about the air quality in the air cabin, plane cabin, that older aircraft toilet facilities with chemical vapors operating in the air ought to be looked at and some suggestion or regulation be done in that area.

Mr. Chairman, the last question I have is to Mr. Hinman. In your studies, and the studies by the Centers for Disease Control, have you all taken any—into any consideration looking at people who are known to be infectious, I guess tuberculosis is one of the most transmittable infectious diseases.

Do you have any guidelines recommended? To your knowledge, is FAA looking at any guidelines on notice to people or quarantining them on the airplane in some way? And as a final part of that question, what considerations have you given in your studies about the presence of animals in the passenger cabin on the aircraft as far as disease and air quality is concerned?

Mr. HINMAN. Well, sir, I think what we have done is to investigate situations in which passengers have been identified with tuberculosis and then we have tried to investigate what happened to other passengers who were on the flight.

So far in our investigations, we have not found clear evidence of transmission from an infectious passenger to other passengers.

There are—it is true that there are people with positive skin tests who have been on the same flight with infectious passengers. The problem is trying to understand whether their infection is recent or represents something that took place long ago.

Most of the people who have been skin tested positive have had some risk factors for tuberculosis such as having lived in countries with a high prevalence of tuberculosis.

We continue to investigate situations where we have reports of people with tuberculosis who have been on planes to try to understand whether there is any risk to other passengers. So far, we don't seem to find any increased risk compared to contact in any other setting. There was one instance that I reported in which it seems quite clear that a flight attendant infected some other crew members.

Mr. LAUGHLIN. And I——

Mr. HINMAN. I'm sorry; as far as pets are concerned, we have not taken that into account in the studies we have been doing. We have been looking primarily at tuberculosis. We have also looked at measles and influenza as other airborne diseases. These are not diseases typically spread through the air from animals to humans.

Mr. OBERSTAR. The gentleman's time has expired. We can return to another round of questioning.

Mr. LAUGHLIN. Thank you Mr. Chairman.

Mr. OBERSTAR. Mr. Hinman, what effect on the mucous membrane lining of nose and throat and bronchial passages is there from the dry cabin air?

Mr. HINMAN. It can be irritating, sir.

Mr. OBERSTAR. And the mucous membrane is reduced or dried out to a significant degree, does that not allow an entry point for disease?

Mr. HINMAN. I don't feel competent to answer the question, sir. I don't think it significantly increases the likelihood of——

Mr. OBERSTAR. I recall—just make this observation from my own experience with asbestos, which was a significant issue in my district some years ago, on water borne asbestos or asbestos borne particles. In an extensive three-year multiple generation rat study conducted by HEIHS, it was determined that the mucous lining of rats, the laboratory animals used in this study, filtered out the asbestos particles but the asbestos ingested by air was a significantly different issue and where mucous membranes in the thoracic cavity was weakened, reduced; the asbestos particle penetrated and created either asbestosis or the cancerous derivative of that disease.

Now, I think the same from what I have studied of this issue where your mucous membrane lining is sufficiently reduced, damaged, or weakened, it is an entry point for disease. I just think that that is something you folks need to study carefully.

Now, on a flight of 1.5, 2 hours, I don't think it makes a problem. But I think on flights of 3, 4, 5 hours it is a problem. When flight

attendants are in the cabin for 12 and 14 hours, it is a very significant problem.

Is there any known way of filtering viruses out?

Mr. HINMAN. I am not aware of that——

Mr. OBERSTAR. Neither am I.

Mr. HINMAN [continuing]. Of commercially available filters which would do that.

Mr. OBERSTAR. That is just a risk that people take, whether in a crowded room, movie theater, or at home or cabin aboard an airliner.

Mr. HINMAN. Yes, sir.

Mr. OBERSTAR. Has any study been done on the sufficiency of the exchange rate aboard aircraft?

Mr. HINMAN. Sufficiency of exchange rate of what?

Mr. OBERSTAR. Of air exchange aboard aircraft.

Mr. HINMAN. With respect to what, sir?

Mr. OBERSTAR. With respect to health, clearing out substances that are in the air, in the environment.

Mr. HINMAN. I am afraid I can't answer that question. I have no——

Mr. OBERSTAR. Dr. Jordan, Mr. McSweeny.

Mr. JORDAN. The data available to us currently, as a result of studies that have been done, really don't show much of a distinction between those aircraft that totally exchange the air and those that recirculate the air.

Mr. OBERSTAR. You are saying there is no——

Mr. JORDAN. The short answer is with the aircraft that recirculate the air, we do not see any enhanced health issue that arises from that use of recirculated air.

Mr. OBERSTAR. You are saying then in answer to the question that the current—whatever standard there is or whatever practice there is, is sufficient?

Mr. JORDAN. Yes, that is correct.

Mr. OBERSTAR. What about the replacement of filters aboard aircraft? What was the basis for determining that it should be done every 3,000 to 5,000 hours?

Mr. MCSWEENY. That was based on the recommendation of the filter manufacturers. I would assume it is based on a lot of experience they have with their——

Mr. OBERSTAR. So the FAA accepts that?

Mr. MCSWEENY. FAA would certainly lean heavily on the recommendation of the manufacturer if we felt they had a lot of experience in what they were recommending, yes.

We have adopted those recommendations in the carriers' operational programs and they become a requirement on the carriers to have those filters changed at that interval.

Mr. OBERSTAR. And you have not done any independent inquiry into the sufficiency of replacements?

Mr. MCSWEENY. I don't believe we have, no.

Mr. OBERSTAR. Has there been any examination of filters done after removal to see what materials have been trapped in the filter?

Mr. MCSWEENY. I don't have direct knowledge, but I recall a manufacturers' report that deals with a study done of some filters

that were removed. They looked at the contamination that was present on both the up-flow side of the filter and the down-flow side of the filter.

Mr. OBERSTAR. Is there an FAA standard for filters or is it just that you accept what the manufacturer recommends? Do you require them to be used?

Mr. MCSWEENY. There is not a standard. There is not a specific requirement in the regulations that says you have a filter. But, frankly, I think you are aware that there are many things that are not in the standards that we in the FAA have all the authority we need to enforce. I would believe we would not allow recirculation without a HEPA type filter.

Mr. OBERSTAR. Some aircraft are equipped with supplemental air providers that does not use engine bypass air. Have you made an analysis of any difference in air aboard aircraft using such equipment?

Mr. MCSWEENY. Gosh, I don't think we have made any distinction between that type of equipment in any of the studies that I recall reading. No.

Mr. OBERSTAR. Has there been consideration of a rule-making on filters, frequency of change, on amount of air exchange aboard aircraft?

Mr. MCSWEENY. We have not considered anything relative to the filters. We believe the present practice, and the fact that we can enforce that inspection interval through the operating requirements and the operating specifications of the carriers, is sufficient.

Mr. OBERSTAR. How long will it take to initiate a rule-making on that subject?

Mr. MCSWEENY. Oh, it would take not very long to initiate that. We can initiate anything we choose to at any time we wish to.

Mr. OBERSTAR. I have a feeling that the outcome of this hearing is going to be a recommendation that the administrator initiate such a rule-making, or that the Department initiate such a rule-making, and maybe a multifaceted request.

Mr. Canny, I commend the Department on its efforts with Australia, Canada and New Zealand to ban smoking on extended-hour flights, 14-hour flights, that is 22 hours, at least to Australia and New Zealand, and your initiative with Jamaica, as you testified, and the CARICOM nations, you have had discussions with other countries.

Have you gone a step further and considered just opening an amendment to existing bilaterals with countries such as France?

Well, you can't do it with France, because they have renounced the bilateral. The U.K., Germany, Italy, on the continent, domestic flights, and within countries and among countries in the EC, their airplanes are just chock full with smoke. You gasp when you get on board.

Has the Department given consideration to amending the bilateral on a one-on-one basis and said let's get a wedge in here and make an agreement with one of these countries who seems willing to do it?

Mr. CANNY. Yes, but we are really starting with the Canadians, New Zealanders and Australians. We think that we want to start with countries where we know there is an interest and some co-

operation, and hope we can build some momentum there and then begin to roll from that into the situations where there might be a little more resistance.

But we have been talking to governments, to embassies here, and so on, from several countries around the world, Asian countries, European countries as well, to lay the foundation for that. We don't have anything specific that we can report at this point, but we think that we will be making some progress over the next year or so.

Mr. OBERSTAR. Well, how long do you think it would take to get an agreement with Canada?

Mr. CANNY. We thought we would have that quadripartite agreement before this point. It has been held up due to a bureaucratic disagreement in one of the other countries.

I don't want to get into the details of that, but we think that is about cleared away, and we hope that we will be able to have the agreement initialled sometime in the next two or three months.

Mr. OBERSTAR. Thank you.

Mr. Horn.

Mr. HORN. Thank you very much, Mr. Chairman.

I commend you for calling these hearings. I think you have a ready constituency in the Congress of people that spend a lot of time in the air. So we are as concerned as the flight attendants and the average citizen that flies occasionally.

Let me ask you, gentlemen, I am sorry I wasn't able to attend all of your testimony. The Harvard study has been mentioned; I happened to look at the 20/20 videotape last night.

Have any of you reviewed the Harvard study?

Dr. Jordan.

Dr. JORDAN. No, I can't say that I have reviewed the entire study. I have seen some preliminary documentation on what was found in that study. But the actual detailed data I have not seen, and that needs to be seen before you can fully assess the significance of the study.

Mr. HORN. I agree.

Anyone else had an opportunity to review it? Because, obviously, I wanted to pursue with you, did you have any concerns with the methodology and that type of thing?

I assume you will look at it and file for the committee your reaction to the study?

Mr. JORDAN. I certainly can do that, yes, sir.

[The following was received from Mr. Jordan:]

The Federal Air Surgeon has reviewed the executive summary dated May 21, 1994, of the Harvard University School of Public Health report entitled "Aircraft Cabin Environmental Survey." This report by John Spengler, Ph.D., and co-workers has not been presented in a scientific forum nor published in the scientific literature. The Federal Air Surgeon was advised that a complete and final report will not be available for several months. With only summary data and findings available, a detailed critique of the Harvard report is not possible. The Federal Aviation Administration (FAA) medical staff believes, however, that the findings are generally consistent with those made public after previous studies by other organizations, indicating that the aircraft cabin environment poses no unique health risk to passengers and crew.

For example, though focusing on the amount of outside air ventilation in aircraft cabins as suggested by carbon dioxide levels, the Harvard summary nevertheless notes that reduced amounts of outside air do not necessarily translate to poor air quality and increased risk of disease. The report states further that even with recirculating ventilation systems, oxygen is not depleted nor does carbon dioxide increase to levels that interfere with respiration. The report notes, however, that "the practical effectiveness of the ventilation system is ultimately determined by the human response and, therefore, includes additional characteristics of the cabin environment, such as air mixing, direction of bulk air flow, temperature, humidity, draftiness, turbulence, and odors in addition to actual contaminant levels."

In the absence of significant contamination of cabin air, the above factors would suggest either a subjective basis or one unrelated to the aircraft for many occupant complaints. Previous studies have not identified significant levels of contaminants or found objective evidence of disease or injury in persons with complaints about the cabin air. The present report is consistent though it theorizes regarding the possibility of "sick building" complaints of eye and mucosal irritation from exposures to mixtures of volatile organic compounds. None of these compounds was found in this study in sufficiently high concentrations individually to explain reported problems. A recent (March 1993) study published in the New England Journal of Medicine found no relation between availability of outside air and the sick building syndrome.

Dr. Spengler's group also collected and cultured samples for bacteria and fungi. Reporting only those samples analyzed to date, the "bacteria recovered were those typically shed from human skin and mucous membranes, and levels were within the range commonly seen in public environments (schools, office buildings)." Interestingly, the samples collected in the terminal manifested higher bacterial counts than those collected in the aircraft cabins. Fungi levels in dust were within the range commonly found in homes though yeast were "more abundant in aircraft dust than is usual for other public environments." Again, the Harvard report is consistent with those of previous studies.

Not surprisingly, the Harvard researchers found cat and mite antigens and endotoxin in dust samples vacuumed from the cabins. These are ubiquitous, extremely difficult to eliminate even in a private home, and of significance primarily to sensitive individuals who must deal with this problem in many environments of which the aircraft cabin is of relatively minor importance.

The FAA looks forward to its review of the completed report from the Harvard University School of Public Health.

Mr. HORN. Very good.

Except for the smoking which has been mentioned on international flights, the pesticides, I gather, that have been discovered on domestic flights, I gather you all believe the cabin air quality is safe for the average passenger.

And I guess I would ask you; what do you say to the flight attendants that disagree with your conclusions?

Mr. JORDAN. Again, we have to refer to the studies that have been conducted so far and analyze the data that has come out of those studies, and they simply present us with no information that would indicate that there is a health problem in air carrier operations under the current operating rules.

Precisely why some of the flight attendants may be having these reactions, I am not sure I can answer that. It is an unknown at this point in time.

I should note that a study was done by NIOSH out on the West Coast, involving a West Coast airline, and a specific type aircraft that seemed to be an aircraft where there were a number of complaints, especially from flight attendants, regarding adverse health effects. That study was very extensive; it went into the question of—or the issue of review of medical records, measurement of various air quality issues, and NIOSH came up virtually empty-handed in terms of being able to identify a source for those complaints.

Mr. HORN. Any other members of the panel want to comment?

If not, let me pursue a related problem of environmental risk, not necessarily air. This is based on the testimony that Dr. Nagda made before the House Subcommittee on Technology Environment and Aviation on cabin air quality.

My understanding is he is employed by the company GEOMET which the Department of Transportation hired for its 1989 report on cabin air quality. And it boils down to this: that I have heard, mainly through his testimony, that the greatest environmental risk to cabin crew and passengers is from exposure to cosmic radiation.

I would like to know from each of you gentlemen, do you agree with that statement?

Mr. JORDAN. Well, I am not sure I would consider it the greatest risk, especially when talking about insecticides and smoking. But there is a risk from galactic cosmic radiation, no question about it.

In the Agency we have developed guidance material in the form of advisory circulars, both technical advisory circulars and plain-language advisory circulars. One of our experts at the Civil Air Medical Institute in Oklahoma City who deals with radiological hazards has developed software for a computer-based program that allows employers as well as employees to assess their prior exposure to cosmic radiation and to make independent judgments regarding their future flights.

The greatest risks from galactic cosmic radiation comes principally on those trans-polar flights because of the geomagnetic fields, and it is those long trans-polar flights that create something of a problem, especially for the pregnant flight attendant. This is one reason why the FAA is cooperating with the National Institute for Occupational Safety and Health to study reproductive disorders in female flight attendants.

Mr. HORN. If this is a risk, what are the outcomes of that risk for female passengers and workers aboard, mail passengers and workers aboard?

Mr. JORDAN. Well, as far as the pregnant flight attendant is concerned, it would be for the fetus. There is some enhanced risk. You know, you have to take into consideration that these flights are at higher altitudes. Actually people in locations like Denver or any other location of a similar altitude have an enhanced risk, as compared to those individuals who live at sea level. So as soon as you get off the ground, I guess you are enhancing the risks from cosmic radiation.

Mr. HORN. Well, are we talking essentially about various types of cancers or what?

Mr. JORDAN. Yes. You are talking about cancers and premature mortality.

Mr. HORN. And the primary effect is on babies not yet born, do you think, or is it the primary effect on the adult?

Mr. JORDAN. No. The primary effect is on the infant.

Mr. HORN. Is on the infant?

Mr. JORDAN. Yes. Yes, sir.

Mr. HORN. Okay. Well, I would just like to know the degree to which the Agency, the Department are pursuing those matters and what type of methodology has been developed to see the impact. I sit on another subcommittee on the full Committee here known as Water Resources, and one of our problems is in Water Resources, we have got a great advance of technology when we can tell impurities in water up to parts per billion and on, that is way ahead of the law in the area.

Here it seems to me we might not have the proper experiments that have been designed, because maybe we haven't taken it seriously enough, so that we can tell whether it is viruses, pesticides, whatever, that are going through that cabin. In terms of longitudinal studies, what is the impact on very frequent fliers, and the most frequent is, obviously, the crew. And it seems to me you have a living laboratory there; we need to direct and develop studies about and check that methodology.

I must say, just listening to that 20/20 piece, when somebody says 10 people had tuberculosis on that flight, I think that sort of— that is better odds than the California lottery. And that worries me. Can you relieve my worry?

Mr. JORDAN. Well, again, you know with transporting large numbers of people in small confined spaces, and any time you have that set of circumstances, then you certainly have the environment for transmission of disease. But I don't find that the air carrier environment presents a substantial risk that people need to be concerned about.

I fly every day, just as most of the people in this room do, and I consider it a safe environment, and I do not find it an unhealthy environment.

Mr. HINMAN. Could I add something?

Mr. HORN. Sure. Please do, Dr. Hinman.

Mr. HINMAN. Just two brief comments.

One, without knowing all of the particulars of what was said on the 20/20 report, I believe that is the investigation of which I am

aware that there were 10 passengers found to have positive skin tests, and that it is not known when they became infected. Several of them had lived in countries with high prevalence of tuberculosis or had other risk factors for tuberculosis, and none of them had active tuberculosis disease. This was tuberculosis infection, such as several million Americans have.

The second thing is, with respect to reproductive outcomes, there is a multiyear study that is presently at the feasibility study stage looking at adverse reproductive outcomes in flight attendants. And this is particularly geared I think to questions about radiation, but it is also going to be looking at some other aspects of the cabin environment. But it is focusing specifically on reproductive outcomes.

Mr. HORN. I think when you do get your hands on the study that related to the 10 TB cases, it would be fine I think with us if you filed some sort of statement, either about the methodology or the things not covered or whatever, so we round out the picture.

Mr. OBERSTAR. I thank the gentleman. And I would encourage you to provide the committee with that information.

[The information received follows:]

The 10 cases of tuberculosis referred to in the Congressional testimony are, in fact, not 10 cases of disease but rather 10 passengers who had a positive tuberculin skin test indicating tuberculous infection not disease.

The situation involves an international passenger who was found to have active TB upon arriving in San Francisco. The California Health Department conducted the investigation. The passengers on the flight were contacted by the health department and requested to have tuberculin skin tests performed by their private physicians or by the local health department. Of the passengers tested, no one had tuberculosis; but 10 individuals had positive skin tests that indicated tuberculous infection, as do several million other Americans. The investigators could not determine whether these passengers were infected as a result of being on the flight or whether they were infected earlier in life or whether they received BCG vaccine, which produces a positive skin test result.

Mr. OBERSTAR. Mr. DeFazio.

Mr. DEFAZIO. I thank the Chairman.

Since we are into a methodology discussion, I guess I would like to go back then to Dr. Jordan's testimony and ask about the studies which he quoted in his testimony. I would assume that unlike the Harvard study which he hasn't read in detail, he has read these studies in detail; is that correct?

Mr. JORDAN. That is correct, yes, sir.

Mr. DEFAZIO. Okay. How were they conducted?

Were they conducted—on the what place in the aircraft were the—where were the devices placed?

Mr. JORDAN. Well, it varies from study to study. The GEOMET study was somewhat different from the study that was performed by ATA. But in the ATA study, the specimens or samples were collected in the forward section of the passenger cabin, and in the aft section, and in the mid section.

Mr. DEFAZIO. And then they were averaged?

Mr. JORDAN. Yes, that is correct.

Mr. DEFAZIO. I see. There are a lot fewer people sitting in the forward section than in the mid section or the aft section, so were they averaged and weighted toward occupants?

Mr. JORDAN. Well, we know the load factors in the aircraft; exactly where the people were sitting at the time that the specimens were collected, I do not know.

Mr. DEFAZIO. I am merely reflecting on the difference between first class and coach.

Mr. JORDAN. Oh, I see.

Mr. DEFAZIO. A forward cabin has a lot more cubic feet of space available per passenger and there are fewer people occupying the space as opposed to the cabin.

Mr. JORDAN. Yes, that is correct, and that is why measurable levels of bacterial aerosols, carbon dioxide, etc., will be lower in the first class section, and lesser density of people.

Mr. DEFAZIO. Right. But we are not regulating to the most impacted part of the cabin then, or we weren't—I mean, do you have the parameters of the study for the most impacted part of the cabin and the least impacted part of the cabin?

Mr. JORDAN. I think you can safely say the greatest impact would be in the aft part of the cabin.

Mr. CANNY. The GEOMET study was done under our direction. I can tell you a couple of things about the methodology used.

First, the measurements were taken without the knowledge of the flight crew. There was no going on board and alerting the pilots and telling them to turn up the packs, as you had suggested might have been possible. We didn't do that. It was done without the flight crews' knowledge.

The measurements were taken at various points in the aircraft, and it depends upon whether they were smoking or no-smoking flights. We were at the time when we were in-between on that.

For smoking flights, there typically were four locations in the aircraft: One, in the smoking section; one in the nonsmoking section, but near the boundary; another in the overall nonsmoking section in the tourist class, if you will; and I think a fourth in the business or first class section.

For nonsmoking flights, there were just two measurements taken. They were, as I recall, both in the tourist cabin. Not any particular location close to the front or rear.

Mr. DEFAZIO. Was there a post-study interview done of each pilot immediately upon landing to find out what condition the plane had been operated in, in terms of packs, so we could have a control; or was it just, we are just measuring what happened and it just happened randomly, you ended up on flights where they provided full packs versus flights where they didn't?

It seems to me you got a little control problem here.

Mr. CANNY. Yes. I am told that we did not do a post-flight interview with the pilots. We did more than 90 flights, though, and our indication is that that is a sufficiently large sample that we had pretty much the full range of operating conditions.

Mr. DEFAZIO. Well, of course, you have different types of aircraft, with different capabilities, different exchanges, different operating conditions and different passenger load factors. I guess I just have some questions.

The Harvard study, which we have seen but you haven't reviewed, does make a conclusion that the ASHRAE 6289 ventilation standards for offices are not being met in airplanes with recirculating ECUs. Whereas we heard earlier testimony that, gee, it was better air there than you get in your average office. You seem to have contradictory conclusions. Well, until you review that.

If I could, Mr. Chairman, just one other question, just to the DOT.

I guess in response to my earlier carrying on there, I feel very strongly about this issue, given the number of times I have sat here and been assured something was going to happen and it hasn't. Let's put it a little less heatedly, to either DOT or FAA.

Given the fact that for a couple of decades now you have had the authority, having preempted OSHA, as Federal agencies are allowed to do, to regulate industries under your control, you have had a couple of decades to promulgate OSHA-type workplace regulation. You have chosen not to do that while we are considering OSHA reauthorization.

Why should we either shift that authority back to OSHA since you have chosen not to do it, or two, perhaps put a time line on you, that is to say if an agency has taken an exemption and in 20 years or maybe even a year they haven't promulgated regulations that the authority would go back to OSHA. And I guess the third option is to say you just don't think that workplace health and safety OSHA-type requirements are necessary. So what would be your preference here?

Mr. CANNY. Mr. McSweeney might want to supplement this, but I would say the latter. There are some specific problems. You mentioned the insecticide spraying, and that is one that we are trying to deal with. And the remnant problem of smoking on international flights is one that we are seriously concerned about, and we are trying to deal with both cases, initially at least, through nonregulatory methods.

Aside from that, I think the preponderance of the testimony this morning, particularly from Dr. Jordan and our assessment of the state of knowledge is that there is not a serious cabin air quality problem aboard air carrier airliners that is of a magnitude that would warrant regulation.

Mr. DEFAZIO. Well, that is an interesting assertion, and not I notice the word "serious" and with merit. So I assume we are weighing some sort of cost-benefit analysis here toward the airlines in terms of what it would cost them to comply some new regulations regarding workplace health and safety. Is that one of the qualifiers?

Mr. CANNY. That is a part of it, but not the dominant part of it.

Mr. DEFAZIO. How about the word "serious." How about just saying there is absolutely no cabin air quality problem. Can you say that?

Mr. CANNY. No, I don't think we can.

Mr. DEFAZIO. All right. So we are——

Mr. CANNY. The point is that it is not very different from the problem in an airport waiting room or in many other places in which large numbers of people congregate.

Mr. DEFAZIO. Right. Which we would not exactly call desirable workstations or situations which are in fact regulated by OSHA.

Mr. CANNY. And where the conditions are not materially different from what they are in the unregulated state.

Mr. DEFAZIO. Well, the Harvard study reaches a different conclusion. So we are back to—I mean, the puzzling fact of an agency

that promulgates a standard which says it is adequate. Both were designed in operation. I mean, again, I put to you, that is a dream.

We could put that to the nuclear industry. They would love it. Adequate safety standards and adequate disposal of nuclear waste. Here we have a resurgence. Westinghouse stock would blast up to $500 or $2,000 a share. Give it to Detroit.

I mean, all of this pestering stuff about, oh, my God, these things that have to do with airbags and seat belts and shoulder harnesses. Why not adequate protection for passengers should be provided.

Adequate. Hum? That sounds like a great standard. I mean, just think what we could do away with. I mean, this would be what Ronald Reagan promised us.

We would finally get there. We are going to reduce the Federal regulations down to this instead of 8 million pages, or whatever it is. It is an interesting idea but one that I particularly find irrelevant. And I think you have been imbued with the Elizabeth Dole philosophy, that maximum deregulation or radical deregulation is a great thing.

I don't. I support the Chairman. I think you will receive a directive from this committee to get off your butts and do something in these areas, because there are problems, despite these rather glib assertions or using words like "serious" in a qualifying statement.

I thank the Chairman.

Mr. OBERSTAR. The gentleman from Texas, Mr. Laughlin.

Mr. LAUGHLIN. Thank you, Mr. Chairman.

Secretary Canny, just following up on my comments about animals on the passenger side of the cabin; I would ask you to refer the appropriate person at the FAA to their aircraft cabin environmental study done under the direction of the Harvard University School of Public Health, a copy of which we have here. On page 5, the very top sentence says: All dust samples had measurable quantities of cat and mite antigen.

Antigen wasn't in my vocabulary so I had to scurry around the room to find out, that is the thing that causes people to have allergic reactions. So maybe there is some scientific support for my concern for having the dogs and the cats and the other animals in the cabin. And I would just ask that the appropriate person at the FAA review that. I understand that other witnesses in addition to Dr. Spengler will be testifying on this problem.

Thank you very much.

Mr. CANNY. We will be doing that, as Dr. Jordan indicated. I might note, I think perhaps we are reading from the same document on the Harvard study, which is just a summary. It goes on to say that the presence of cat allergens in aircraft isn't surprising, considering the carriage on clothing; just the cat dander adheres to the clothing of people when they are boarding. And also the presence of cats.

But it can be a serious problem. I have relatives who are seriously allergic to cat dander, so I think it is one that we will look at.

Mr. LAUGHLIN. Well, fortunately, I am not allergic to them, to my knowledge. We have a very large cat named Snowy who travels frequently, but Snowy does not travel in the passenger cabin.

Thank you very much.

Mr. OBERSTAR. All right.

I want to thank our panel for their presentations today.

And I just want to make a final observation. The review by DOT, by FAA, studies by NIOSH and other governmental agencies, do not, according to your testimony, document to your satisfaction, substantiation of causality, of serious ill-health of passengers or flight attendants from cabin air quality.

Nonetheless, the overwhelming evidence from passengers and from flight attendants is, they get sick. They have adverse reactions.

Mr. CANNY. I think you are——

Mr. OBERSTAR. Unfortunately, they don't—they are getting sick and something needs to be done.

Mr. CANNY. Your colleagues, Mr. Chairman, indicated previously that in years of travel, Mr. Laughlin, Mr. Lipinski, haven't encountered such a problem. They haven't had flight attendants, other passengers, frequent fliers approach them and say: Why don't you do something about this? As was indicated, it is a very complicated area and one that we don't minimize the importance of. But neither do we see that there is a major public health problem that would require regulatory efforts such as airbags or mandatory safety belt use or something of that sort.

Mr. OBERSTAR. It is not epidemic proportions, Mr. Canny. But it is significant. And we are holding this hearing for the purpose of documenting, and I think that in the end, just as with safety, in which FAA has established a remarkable record: It doesn't do safety at the margin, it doesn't require safety at only that level that can be afforded. Its persistence in redundancy is extraordinary.

Safety in health is no less significant. I have chaired enough hearings on the Committee of Investigations and Oversight on safety and in this Subcommittee on Aviation on safety to know what I am talking about.

And we build redundancy in to make sure that aviation is the safest possible means of travel. And I think we need to turn the same philosophy to health aboard aircraft. And this administration is at the point where it has an opportunity to do something really significant. And we are asking you to take those steps.

Mr. HORN. Mr. Chairman, I would like to——

Mr. OBERSTAR. Mr. Horn.

Mr. HORN. I would like to put four questions in the record, and if you gentlemen would respond, I would appreciate it. Because I know we are trying to move along here with the hearing.

Dr. Hinman, for the record, just what is your opinion of the studies done by the Department of Transportation, the Air Transport Association, their 1994 study, the Transportation Department's 1989 report on smoking, and when you get it, which I have already asked for, the 20/20 study completed by the Harvard professors? I am interested, do you agree with the findings of the reports and should something be done, and in your professional judgment, Dr. Hinman, because you operate outside of the Department of Transportation? So we would expect an objective opinion.

[The following was received from Dr. Hinman:]

Dr. Hinman: In response to your request to provide my professional opinion of these studies, I have reviewed the following documents:

(1) Report of the Air Transport Association-commissioned "Airline Cabin Air Quality Study" by Consolidated Safety Services (CSS) as submitted with the statement of James E. Landry, President of the Air Transport Association (ATA);

(2) Summary of "Airliner Cabin Environment: Contaminant Measurements, Health Risks, and Mitigation Options", by Nagda et al. of Geomet Technologies;

(3) Executive Summary as of May 17, 1994 of "Aircraft Cabin Environmental Survey", by Spengler et al. of Harvard University School of Public Health.

To provide a comprehensive response, I consulted with subject matter experts within the following operating divisions of the Centers for Disease Control and Prevention: the Office on Smoking and Health of the National Center for Chronic Disease Prevention and Health Promotion, the National Center for Environmental Health, and the National Institute for Occupational Safety and Health (NIOSH). Our composite remarks are as follows:

1. General Comments:

Current Department of Transportation (DOT)/Federal Aviation Administration (FAA) standards for aircraft cabin ventilation (14 CFR, Chapter 1, Parts 25.831 and 25.832), that are designed to protect the general public as well as flight crew, allow levels of carbon dioxide, carbon monoxide, and ozone exceeding current occupational exposure criteria.

The OSHA permissible exposure level (PEL) and NIOSH recommended exposure level (REL) for CO_2 are 5000 parts per million (ppm), while the FAA allows up to 30,000 ppm. The NIOSH REL-Time Weighted Average (TWA) for CO is 35 ppm, and NIOSH recommends adjusting for altitude (e.g., adjusted for 8000 ft. cabin altitude of an MD-80 it is 20 ppm), the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV)-TWA is 25 ppm, while the FAA allows up to 50 ppm. NIOSH and ACGIH recommended ceiling limits for ozone are 0.1 ppm, while the FAA allows up to 0.25 ppm ceiling limit above flight level 320, and has no ceiling limit (rather, a 3-hr TWA of 0.01 ppm) for lower flight levels, which would not preclude peak levels above the NIOSH REL.

Further, FAA requires 10 cubic feet per minute (cfm) per crew member be supplied to passenger and crew compartments as a minimum outside air ventilation rate, while the American Society

of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) recommends a minimum of 15 cfm per occupant for "vehicles" (there is no specific standard for aircraft). Since the total number of occupants usually exceeds the number of crew members by a factor of 20 to 50, this in effect means that the FAA requires substantially less fresh air than is recommended by ASHRAE (and NIOSH since it endorses ASHRAE recommendations).

2. Report of the ATA-commissioned "Airline Cabin Air Quality Study" by Consolidated Safety Services (CSS) as submitted with the statement of James E. Landry, President of the Air Transport Association

OSHA PELs and ACGIH TLVs are intended for use in the evaluation of occupational exposures. They are not applicable to community exposures because of the presence of more "susceptible" individuals such as young children, the elderly, and persons with underlying chronic diseases in the community. Thus, OSHA PELs and ACGIH TLVs may be appropriate for evaluating the aircraft cabin environment for purposes of assessing exposures of crew members, but not those of passengers. Furthermore, the CSS report's statement that OSHA PELs were developed "through extensive research" (page 2-6) overstates the case; most of the current PELs were adopted as "consensus" standards, based on less than extensive scientific documentation.

The OSHA PEL for CO_2 is not relevant, even in the occupational setting. The PEL (10,000 ppm), and the more stringent ACGIH TLV and NIOSH recommended exposure limit (5,000 ppm), are intended to prevent potentially toxic exposures to CO_2 per se, whereas the ASHRAE guideline (1,000 ppm) is designed as a measure of the adequacy of ventilation. The CSS report takes note of this, but cites the PEL anyway.

It is not clear how all the environmental monitoring was done without the flight crew being aware, or at least suspicious, of what was occurring (pages 2-3 & 2-6).

Placement of monitors with respect to passenger or crew member breathing zones (air contaminants) or ears (noise) is not described in the report.

The PEL for particles "not otherwise classified" is biologically (as distinguished from legally) inappropriate for assessing exposures to microorganisms (viable or nonviable) or allergens such as pollen (pages 3-1 & 3-3).

There is no official NIOSH action level for airborne microorganisms. The figure of 1000 colony forming units per cubic meter may have been used in the past in a NIOSH report, or in a presentation by a NIOSH researcher, but if so, it

represented professional judgment based on the state of the art at the time. In any case, it has not been used by NIOSH personnel in recent years (Results Section A.2, page 3-3.)

The lack of medians or means in the presentation of the microbiologic sampling data (Results Section A.2) precludes meaningful comparisons between aircraft types or between early and late samples.

Analysis of CO2 levels by load factor (i.e. number of passengers/number of passenger seats) would be informative of ventilation system capabilities, as would analysis by aircraft type for flights with high load factors (Results Section B.1).

Analysis of relative humidity (RH) by load factor would be informative (Results Section B.2). Considering the differences between first class and coach (presumably due to differences in occupant density), a crowded plane might have relative humidity readings in or near the ASHRAE comfort zone.

The CSS report takes no note of the finding that the average temperature of 3 of the 4 aircraft types exceeded the ASHRAE guideline, even without a full load, and that the average temperature of aircraft with recirculating air systems was higher than that of aircraft without recirculation (Results Section B.3). Although this is not necessarily a health hazard, it might suggest inadequate performance of the ventilation system.

The average noise levels measured by CSS are not a health concern, but ranges would be more informative (possibly indicating certain areas with excessive noise), as might analysis of noise level by load factor (Results Section B.4). The statement about new aircraft being quieter (page 3-19) is not supported by the data; the B757 (new) was the quietest, but the B727 (old) was quieter than the MD80 (new).

There are three conclusions with which one might differ (pages 3-22): (1) although low RH is not conducive to microbial growth, the dryness of the cabin air would not necessarily contribute to the reduction of airborne particulates since microorganisms are only one component of these particulates; (2) temperatures may have been stable, but they were often above the ASHRAE guideline; and (3) low levels of "biologic contaminants" might be more related to an adverse environment for growth (low RH, general cleanliness) than an effective ventilation system.

3. <u>Summary of "Airliner Cabin Environment: Contaminant Measurements, Health Risks, and Mitigation Options", by Nagda et al. of Geomet Technologies</u>

The "most remote" part of the coach no-smoking section (page 1) could be near the first-class smoking section, and this could

account for the fewer positive nicotine samples in the middle rows (Exhibit 1).

Ranges, in addition to averages, of bacterial and fungal levels, would be informative, and depending on the distribution of the data, medians might be more representative of the findings than averages (page 2).

Many details of the cancer risk assessments (pages 3-4) are not provided, so the results cannot be adequately evaluated. Also, the risk assessment for environmental tobacco smoke addresses only lung cancer (quantitative data for a risk assessment of other health effects may not have been available at the time of the study).

The report discusses the monitoring strategy, but provides little detail about the measurement methods.

4. Executive Summary as of May 17, 1994 of "Aircraft Cabin Environmental Survey", by Spengler et al. of Harvard University School of Public Health

Laboratory procedures are said to be "reported elsewhere", but no references are provided (page 3, 1st paragraph).

No data are provided to support the statement that CO2 levels were twice as high on flights with recirculating air systems (page 3, 4th paragraph).

The presentation of noise level results could be more specific; for example, it's not stated where the peaks occurred and what the means (or medians) and ranges were for the various locations and aircraft (page 4, 3rd complete paragraph).

Statements about differences in bacterial levels within and between aircraft may be premature since only half of the samples had been analyzed at the time of the report (page 4, last paragraph).

The statement that total non-methane hydrocarbon levels were "quite high" and exceeded concentrations associated with "sick building complaints" could be misleading (page 5, last paragraph). The predominant constituent of the volatile organic compounds (VOC) was ethyl alcohol (presumably from beverages), and even accepting the claim of an association between relatively low (by industrial standards) VOC levels and symptoms among building occupants, ethyl alcohol is a relatively less potent inhalational toxin and surface irritant than many (if not most) of the other components of the VOC mixture in typical non-industrial indoor environments.

83-115 O - 94 - 4

The statement that mite and cat allergens "may contribute to complaints in sensitive passengers and crew" could be misleading (page 6, 1st complete paragraph). These antigens are ubiquitous in the community, and there is no apparent reason why levels of allergens or endotoxins (page 6, same paragraph) are higher in an aircraft in flight than in other densely occupied community environments.

5. Conclusion:

The noise levels measured by the Harvard study were much higher than those in the CSS study. This could be due to different methods. The Harvard study used a direct-reading instrument, while the CSS study used dosimeters. The latter more accurately represent personal (or area) noise exposure over a period of time, but the former can more efficiently evaluate noise sources and spatial patterns. Except for this difference in noise measurements, and the somewhat higher temperatures measured by the CSS study, there were no substantial disparities among the three studies with respect to environmental parameters or air contaminants. The major differences were in their interpretation. The CSS study tended to minimize the importance of results that might suggest any problem, whereas the Harvard study tended to maximize speculation about their health implications.

Mr. HORN. Mr. Johnson, I applaud the Department of Transportation's efforts to discourage countries from spraying insecticides when passengers and crews are on board. However, if insecticides are sprayed in empty aircraft cabins, what is the risk to passengers when they fly in cabins that were not properly ventilated or cleaned after the spraying of insecticides?

In other words, I find a lot of OSHA violations, for example, since OSHA has been mentioned, often result from the human behavior and lack of training of the employees assigned to do a particular job. And a real look I think ought to be taken at how those insecticides, pesticides, whatever, are administered, how much time is given for ventilation, et cetera.

In terms of Secretary Canny, and Mr. Johnson, what options do flight crew and passengers have if they do not want to be present when insecticide spraying occurs? If all crew members and passengers must be present, is there anything they can do to lessen their exposure to insecticides?

[The following was received from Mr. Canny:]

The practice of insecticide spraying, or disinsection, dates from the 1940's when many countries became aware that international air travel made it possible for insect carriers of human diseases and for agricultural insect pests to be readily transmitted from country to country. The Chicago Convention, to which the U.S. was signatory, permits countries to require disinsection in a manner similar to that in which countries recognize each others' customs, inspection and quarantine requirements as a condition for entry into the country.

The purpose of conducting disinsection with passengers and crew aboard was to ensure that insects that may have come aboard with passengers at a previous stop or simply flown in while the doors were open there, would be killed before the doors were opened in the new country. It is noteworthy that, in the early days of aircraft disinsection, DDT was the material of choice for spraying. As time passed and we learned more of the dangers of materials previously considered safe for spraying, many countries discontinued the practice of requiring it. For those few countries that have not discontinued the practice, it is still their recognized right to require disinsection. Those countries can, and do, forbid arriving aircraft from opening their doors until disinsection has been conducted.

Passengers and crew of aircraft arriving in a country that still requires disinsection by spraying have, in fact, no alternative to being present while disinsection takes place. The same requirements generally apply to all arriving flights, regardless of airline or point of origin. That is why Secretary Peña is acting to notify air travelers concerning those countries that require disinsection by spraying, so that those persons who might be adversely affected can exercise the option they do have: that of altering travel plans. Because such actions by air passengers have potential for adversely affecting travel and tourism, the Secretary is taking care to be certain of which countries disinsect and, on consideration of the potential impact, wish to continue requiring disinsection and thus be included in the Department's notification.

Mr. HORN. And then to Mr. Jordan, finally, you mentioned that air quality aboard the aircraft is at least as good as that commonly found in many indoor workplaces or office environments. Do you have any data to support the claim? Could you provide it for the subcommittee, Dr. Jordan.

Thank you.

[The information follows:]

[The following was received from Dr. Jordan:]

Air carrier aircraft fly at altitudes free of the ambient pollution that persistently seeps or is deliberately blown into our offices and homes. the 10 to 27 exchanges per hour with this clean air in aircraft contrasts with 2 to 4 exchanges in offices and 0.35 to 1 exchange in homes with outside air usually containing a wide spectrum of contaminants. Those aircraft that recirculate some part of their cabin air pass it through high efficiency particulate filters that far surpass the efficiency of filters used in most office buildings and homes. Recent studies have confirmed the absence of known harmful levels of carbon dioxide, carbon monoxide, respirable particulates, volatile organic compounds, and bacterial and fungal contaminants in the aircraft cabin. The levels measured have been consistently below action levels established by regulatory agencies for workplaces, including offices.

Low humidity in air carrier aircraft reduces the risk for biological growth. Though sometimes uncomfortable for passengers and crew, the low humidity may be countered by fluid intake. The National Research Council, in its 1986 report on air quality in the airliner cabin environment, concluded that health risks associated with clean, dry air appear to be quite low, especially for normal people, and probably do not justify the cost and potential for microbiologic complications that would attend installation of active humidification systems in aircraft.

In view of findings of the absence of harmful contaminants of air carrier cabin air, we believe, from a health perspective, that the air quality aboard aircraft is at least as good as that commonly found in many other indoor workplaces or office environments.

Mr. OBERSTAR. Please submit those responses to those questions, both to Mr. Horn and to the subcommittee. We welcome your responses.

We thank you very much for your presentation this morning and we look forward to working increasingly closely with all of you on this very, very important subject.

Thank you.

[Subsequent to the hearing, the following was received from the U.S. Environmental Protection Agency:]

U.S. ENVIRONMENTAL PROTECTION AGENCY'S RESPONSES TO CHAIRMAN OBERSTAR'S QUESTIONS REGARDING THE USE OF PESTICIDES IN AIRLINERS

Q. 1. If insecticides are sprayed in empty aircraft cabins, what is the risk to passengers when they fly in cabins which were not properly ventilated or cleaned after the spraying of insecticides?

The EPA-registered pesticides which are labeled for use in an airplane's cabin area all contain the active ingredient sumithrin. Sumithrin is a chemical that belongs to the synthetic pyrethroid family. As with other structurally similar chemicals, sumithrin poses a low risk of toxicity to man and other mammalian species. Sumithrin is a degradable contact insecticide. The consequence of this characteristic is that the chemical dissipates rapidly and does not provide for long-term or residual control of insect pests. Rather, chemicals in the pyrethroid family are known as "knock down" sprays, affecting insect pests more directly exposed to the application. For passengers entering an airplane following the treatment of an empty cabin, the health risks are expected to be quite low. EPA has not received any reports of illness following such exposures.

In spite of EPA's conclusions in this regard, there are a small number of incidents of reported an adverse reaction in which passengers and crew were directly exposed to the application while the cabins were occupied. EPA has received reports that six people in separate incidents have suffered reactions to in-flight spray. As described in EPA's statement at the May 18, 1994, hearing, because of these reports and questions about the efficacy of this treatment for controlling insect pests, EPA considers the use of an in-flight spray to be unnecessary. Accordingly, EPA supports the initiative, led by the Department of Transportation (DOT), to work with health officials in other countries on this issue. This discussion may lead to the revocation of the in-flight spray requirement by other governments.

Q. 2. What options do flight crew and passengers have if they do not want to be present when insecticide spraying occurs? If all crew members and passengers must be present, is there anything they can do to lessen their exposure to insecticides?

It is EPA's understanding that passengers and crewmembers who want to avoid exposure to the in-flight spray do not currently have any options if they are on-board a flight to a country which imposes the in-flight spray requirement. EPA is not aware of any persons who have been permitted to de-plane prior to an application. Accordingly, EPA strongly supports the development of an adequate passenger notification program. EPA believes it is necessary to notify passengers when their travel arrangements are made so that they may make informed plans.

Chemically sensitive or highly allergic individuals should consider whether it may be preferable to make alternative travel plans. Of course, this is not a viable option for airline personnel.

A less immediate resolution to this situation may develop from the international discourse that is currently underway through DOT. The purpose of these discussions is to present foreign governments with the information that led U.S. health officials to rescind the in-flight spray requirement for airplanes that arrive in this country more than 15 years ago. The U.S. experience over this timeframe should encourage other governments along these lines. In the U.S., there have been no outbreaks of vector-borne disease that can be attributed to imported vectors aboard aircrafts entering this country. EPA is eager to support this inter-agency and international effort.

Mr. OBERSTAR. Our next panel includes those who are exposed to cabin air quality. Ms. Dee Maki, National Association of Flight Attendants, accompanied by Chris Witkowski, Director of Safety and Health, Association of Flight Attendants; Ms. Deanne Clarke, Flight Attendant for a national carrier; Ms. Joyce Hagan, flight attendant for a major carrier, accompanied by Ms. Beth Welker, also a flight attendant; Ms. Mary Ellen Miller, Director of Health and Safety, Independent Federation of Flight Attendants; Patty Young, a flight attendant; Ms. Donna Hendrich, Division President, Airline Division, Canadian Union of Public Employees.

Very distinguished panel. Very experienced panel.

Welcome to our hearing, Ms. Maki, we will begin with you.

TESTIMONY OF DEE MAKI, NATIONAL PRESIDENT, ASSOCIATION OF FLIGHT ATTENDANTS, ACCOMPANIED BY CHRIS WITKOWSKI, DIRECTOR OF SAFETY, ASSOCIATION OF FLIGHT ATTENDANTS; DEANNE CLARKE, FLIGHT ATTENDANT; JOYCE HAGAN, FLIGHT ATTENDANT, ACCOMPANIED BY BETH WELKER, FLIGHT ATTENDANT; MARY ELLEN MILLER, DIRECTOR, HEALTH AND SAFETY, INDEPENDENT FEDERATION OF FLIGHT ATTENDANTS; PATRICIA YOUNG, FLIGHT ATTENDANT; AND DONNA HENDRICK, PRESIDENT, AIRLINE DIVISION, CANADIAN UNION OF PUBLIC EMPLOYEES [CUPE]

Ms. MAKI. Mr. Chairman, Members of the subcommittee, thank you for this opportunity to address the subcommittee about aircraft cabin air quality.

My name is Dee Maki, and I am the National President of the Association of Flight Attendants, AFL–CIO, which represents 33,000 flight attendants and 21 different carriers.

Since the aircraft is a work environment of flight attendants, cabin air quality is a matter of vital importance to AFA. I am here today to discuss the quality of cabin air, its health impact on flight attendants, and the failure of the Federal Government and carriers to address this situation.

Currently, flight attendants and passengers on many flights are not provided adequate amounts of fresh air. And thus, may be exposed to unacceptable amounts of bacteria, viruses and other potential health risks, without the protection of adequate Federal regulations.

This occurs because less fresh air is being circulated in the cabins of the newer airplanes. These planes mix recirculated air with fresh air drawn from the outside of the aircraft. Most planes built prior to the early 1980s were designed to provide 100 percent fresh air that was replaced every three minutes.

Today, newer airplanes offer an even mix of fresh air and recirculated air that is exchanged much less frequently, up to seven or more minutes.

Another cause of ventilation reduction is the fact that flight crews on most aircraft can regulate Environmental Control Units, ECUs, or airpacks, that deliver fresh air. This "flow control" capacity installed to allow crews to adjust airflow when the aircraft is carrying less than a full load of passengers.

However, in this day of fuel conservation, airline carriers may encourage their flight crews to operate the ECUs at a lower level

than is appropriate. This "low flow" or "pack off" saves fuel and money.

Reducing fresh air circulation can increase the amount of airborne toxins, viruses and bacteria in the cabin. If not properly ventilated, a tightly sealed airliner is an ideal environment for the spread of germs. As a result, flight attendants and passengers are exposed to one another's ailments as well as high levels of carbon dioxide and other gasses, including fumes from materials and chemicals inside the aircraft.

Another problem can be attributed to the high-efficiency particulate air filters, or HEPA filters, used on aircraft. While the airlines stress HEPA filters remove a high percentage of airborne particles before air is recirculated in the aircraft cabin, the filters can become clogged. Research has found that flight attendants and airline passengers as a population may be particularly susceptible to infection.

For a variety of reasons, it is difficult to determine how current airline practices contribute to the spread of infectious diseases. For one thing, the government does not monitor or track the frequency or seriousness of crew and passenger complaints regarding cabin air quality. For another, few complaints are reported since flight attendants and passengers may never realize they are contacting or spreading an infection when they fly since they generally scatter once they reach their destination.

In addition, while most people normally would not fly when seriously ill, they may well fly during incubation periods before symptoms of an illness become evident. This incubation period happens to be the period when infections are most likely to be transmitted.

For this reason, it is imperative that all airpacks be operating and the fresh airflow be set on the maximum flow. Recently, the Center of Disease Control and Prevention, CDC, investigated transmission of tuberculosis in the case of two flight attendants who were diagnosed as having tuberculosis after flying with another crew member with active TB.

In October of last year, the CDC concluded that TB was transmitted from an infectious flight attendant to the crew on the aircraft. Researchers also tested a number of passengers who flew with the infected flight attendant during this time. The passengers who tested positive on skin tests all flew when the flight attendant was most infectious. The study concluded that passengers could have been infected with tuberculosis in flight.

AFA has received many complaints from its Members about poor cabin air quality and health difficulties. AFA has reports of flight attendants who have suffered severe headaches, disoriented feelings, dizziness, severe chest pains, stomach cramps and numbness of limbs, just to name a few symptoms. Most of these members have dealt with flight crews and managements who have been unhelpful in assisting them.

AFA is concerned that despite years of talk about aircraft air quality, there has been little action. Federal regulations state that "each passenger and crew compartment must be ventilated" and that the compartment air must be free from harmful or dangerous concentrations of gas and vapors. But there are no standards that

the FAA requires for ventilation rates or maximum airflow for passenger cabins.

Before I conclude my remarks, I would like to make a few comments on the issue of pesticide spraying on international flights. Pesticide spraying required by some governments is subjecting many AFA members to skin absorption and inhaling of pesticides on a regular basis.

The label on one pesticide being used on aircraft warns that the product is hazardous to humans if swallowed, absorbed through the skin or even—if you even breath it. However, while spraying this insecticide, flight attendants as well as passengers who are on board, inhale these dangerous vapors. In addition, since the spray drips down the arms of the person doing the spraying, some pesticide is absorbed directly into the flight attendant's skin.

We are encouraged by Transportation Secretary Peña's recent interest in this issue and are hopeful that the U.S. Government will move forward to protect flight attendants from this dangerous practice of pesticide spraying.

To conclude, the serious health implications of poor cabin air quality is a grave concern to AFA. It is high time that we protect the health of flight attendants and passengers through congressional action if the FAA continues to fail in this area. AFA believes there should be a national reporting system for crew members and passengers so that problems and trends associated with poor cabin air quality can be reported and tracked by the appropriate authorities.

Enough data are already known to warrant the establishment of ventilation standards for the closed environment of aircraft cabins, just as is the norm for public buildings and other facilities. Carriers should make it standard practice to run their airpacks at full capacity even when carrying reduced loads, since reducing total flow usually results in poor circulation patterns in the cabin.

Certainly, flight attendants and passengers should be able to count on some minimum level of fresh air to counter the dangers of the spread of infection and illness when flying.

Mr. Chairman, thank you for this opportunity to address the subcommittee, and I would be glad to answer any questions we may have.

Mr. OBERSTAR. Thank you very much. We will certainly come back to you with questions.

Ms. Clarke.

Ms. CLARKE. Thank you and good afternoon, Mr. Chairman, and Members of the subcommittee.

My name is Deanne Clarke, and I am a flight attendant for a national airline and a member of the Association of Flight Attendants, AFL–CIO.

On behalf of myself and my flying partners, I am pleased to speak to you today on the effect of poor air quality on aircraft.

It has been over a year and a half since I worked the 45-minute flight from Anchorage to Fairbanks, during which I and my three colleagues experienced severe health symptoms. Since that time, I have been unable to work full-time and have seen countless doctors.

While it is frustrating to be ill, what has been equally upsetting has been my company's and the government's total disinterest concerning mine and others' illnesses. The airline and the FAA have refused to do anything about the air quality problem. This is why I am here today. Let me tell you about what happened.

Shortly after departure, I began to experience dizziness, nausea and my hands started to shake. Fifteen to 20 minutes into the flight I had to sit down because my hands were numb. I was having difficulty concentrating and I had excruciating pain in my head.

At this time, two other flight attendants started to feel ill. We reported the symptoms to the pilots. Our symptoms were dismissed without response.

By the end of the flight, I was disoriented. The waves of nausea and pain in my head worsened. I had tunnel vision and my eyes felt like they were being pulled out of their sockets. The skin on my face felt like I had a horrible sunburn. I even experienced a burning and tightness in my chest and my heart was palpitating.

When we landed in Fairbanks, a carrier agent met our plane to help deplane the passengers. Upon deplaning, we asked the agent and other company personnel for help many times without success.

I wandered around the passenger area but could not remember where I was despite the fact that I am familiar with that airport area. I felt like I was going under anesthesia. I heard noises and voices, but could not respond.

My symptoms persisted, as did the symptoms of other flight attendants. One flight attendant's fingernail beds were blue, her heart was racing and her eyes were extremely bloodshot. We continued to try to convince the company that something was wrong and that we desperately needed help.

We described our symptoms, but nobody showed any interest. In fact, they wanted us to get back on that plane and continue working the flight.

Finally, we managed to convince our supervisor that we were ill. She decided to send us to the hospital by company van and we arrived at Fairbanks Memorial Hospital over an hour after we landed at the airport.

Our blood pressure, temperature and glucose levels were taken. That was it. It was not until three hours after the plane had landed that a blood test was ordered to determine the carbon monoxide level in our systems. By this time, I was experiencing muscle weakness, a metallic taste in my mouth and extreme pain in my joints and neck and kidneys.

When I eventually caught up with my colleagues, they were shocked to notice that my hands and lips were deep blue. When the doctor returned he said that he believed that we all had experienced lyophilic gas inhalation injury.

Since the blood tests had been performed so long after the original inhalation, it was impossible to determine which gas or gasses we had been exposed to. We later learned that before we had left Anchorage, our airplane was maintenanced for a faulty thrust reverser while we and passengers were on board. When the work was completed, the mechanics tested the engines. However, the Auxiliary Power Unit, the APU, which is the ground electrical system for planes, was on, the vaporized fuel entered into the plane

through the APU, the air conditioning system and four open doors. We were actually breathing vaporized fuel exhaust during preboarding and in-flight.

Since that horrible flight, I have suffered migraines, a damaged endocrine system and visual disturbance. I also have chronic fatigue, convulsions, a heart murmur and olfactory sensitivity to chemicals.

I have seen countless doctors and have endured a multitude of tests, including EEGs, an MRI and a full neurological and psychological evaluation. The latter test showed that I had lost points of my IQ and now have a learning disability, limited short-term memory and cognitive functioning problems. A year and a half later, while my health has improved, I am still experiencing many of these symptoms.

Sadly, we are not the only group of flight attendants to get seriously ill from poor air quality on aircraft. There were over 235 separate flights with air quality incidents and over 506 related flight attendant illnesses reported from July 1989 to the present on my air carrier alone. These flight attendants have reported headaches, blurred vision and other health problems.

The Association of Flight Attendants contacted the FAA immediately when flight attendants began getting ill. Despite numerous calls and letters, the FAA has never taken any action. In fact, my union learned late last year in September of 1991, that the FAA requested that the carrier no longer send reports on air quality incidents or illnesses to the Agency.

In other words, the FAA did not want to be bothered any further. The union was never notified that the FAA had stopped collecting these important documents.

I am now regularly in touch with my colleagues who experienced health problems due to poor air quality. These are not isolated incidents. On a routine basis, flight attendants are working with severe headaches, stomach pains and nausea, tingling and numbness of the hands, legs and feet, distorted vision, trembling hands and dizziness. In addition, we are often mentally confused and have a difficult time remembering simple tasks or requests.

We are safety professionals responsible for the safety and health of the flying public, who have a difficult time remembering what beverage a passenger has requested and then cannot even hold onto a drink without spilling it, let alone deal with any emergency or evacuation.

When they arrive at their destination, they are met with complete disinterest by the company and struggle along with their symptoms. No one is paying attention to these symptoms, and working to end this serious problem.

Three weeks ago I had another poor air quality incident. Upon boarding the aircraft, my two flight attendant colleagues and I, as well as the captain, noticed a strong petroleum odor in the aircraft. It was causing our eyes to burn and we were all feeling nauseous and getting headaches. We left the airplane to get some fresh air and boarding was held off for a time.

After conferring with the captain, it was decided that we would still work the trip but the captain would fly the plane at a lower altitude with all airpacks working. In addition, he would order re-

placement of the air filters and air-conditioning ducts in his log. He also suggested that the flight attendants use oxygen, if needed.

We worked the flight despite the awful petroleum odor and despite feeling ill. Once again, our health, as well as the passenger's health and safety was jeopardized.

Since the FAA claimed total jurisdiction over airline crew member health and safety in 1975 from OSHA, the FAA has failed to make any serious efforts to address the occupational safety and health issues outside the area of crash survivability. Someone must take responsibility for this real problem that exists on aircraft today and begin to find a solution.

Flight attendants are getting tired of reporting these incidents only to have their complaints fall on deaf ears. More and more flight attendants are merely quietly suffering through the problems rather than to be faced with a total lack of interest.

Something in the air is affecting flight attendants and we must correct it. Too many flight attendants are facing permanent health problems and too many passengers are at risk because flight attendants who are affected by poor cabin air cannot carry out their safety functions.

I urge Congress and the Federal Government to move to improve the quality of air on aircraft so that other flight attendants do not suffer the same debilitating health problems that I now do.

Thank you for allowing me to testify before you and I would be pleased to answer any questions.

Mr. OBERSTAR. Thank you very much for sharing with us a very shocking and painful tale!! That is extraordinary.

Ms. Hagan.

Ms. HAGAN. Good afternoon, Mr. Chairman and Members of this subcommittee. I am here today in strong support of a total ban on smoking on all U.S. carriers operating to and from international destinations for both health and safety reasons. I will, however, limit my remarks today to health reasons.

My name is Joyce Hagan, I am an international flight attendant. I wish to speak on behalf of all international flight attendants who choose not to smoke, but are still subjected every day to the health risks of environmental tobacco smoke.

This unhealthy combination of concentrated cigarette smoke and poor ventilation for hours at a time is our workplace. Cigarette smoke is the single largest complaint by passengers and crew about overall air quality on international flights.

There is no wall, barrier or even curtain to separate the smoking section from the nonsmoking section. On virtually every flight, passengers in the nonsmoking section complain about drifting cigarette smoke. One passenger who suffered from asthma wore a white paper face mask the entire flight, removing it only to eat.

Another family complained as smoke poured from the smoking section behind him, his wife, and several small children for 10½ hours. I have had many passengers ask for wet cloths to put over their nose and mouth to filter out the smoke. One man even slept with a wet handkerchief over his face. Recently, I watched an entire business class cabin suffer from drifting tobacco smoke of two chain smokers.

I was struck by the fact that our work situation is unique. We cannot open a window, take a walk during our lunch hour, or even step outside for a breath of fresh air. Our enclosed work environment is probably the worst case scenario for environmental tobacco smoke imaginable. Yet, in this situation, smokers who are in the minority are granted 100 percent of their right to smoke 100 percent of the time.

Nonsmokers who are in the majority are granted zero percent of their right to breath clean air, zero percent of the time. Cigarette smoke drifts easily and we all breath it. Any flight attendant or passenger, for that matter, who has been exposed to cigarette smoke on an international flight for hours and hours, knows that high concentrations of cigarette smoke generated from the smoking sections cannot be compensated for by increased ventilation. You don't have to be an expert witness here today to know that this is true; you only have to experience it.

Airplanes are simply not designed to handle this situation. We have no separate ventilation system for smokers. The only solution is to ban smoking, as you have done on domestic flights. If this were your workplace and you chose not to smoke, this situation would be a nightmare.

The confined atmosphere in which we work is now known to be toxic and carcinogenic, causing respiratory disease, cancer and heart disease. I can now see the effects of my own exposure to environmental tobacco smoke for the past eight years. On May 6, my doctor advised me that I have the beginnings of a lung disease commonly seen in smokers.

It began with a chronic cough about nine months ago. I now use a steroid nasal spray three times a day, in addition to taking oral medication.

The bottom line is, cigarette smoke makes people sick. It is making many of my colleagues sick; it is making me sick. It is easy to say fly domestic or get another job, but those are harsh remedies in these economic times and financially not possible for many. Besides, this is not a solution to the problem. Someone else would have to take my place and breath the smoke.

Since the EPA report in January 1993, my efforts to get appropriate action from the Department of Transportation and the FAA in this regard have been frustrating. The FAA has the responsibility for the occupational health and safety of cabin attendants. I have repeatedly written, faxed, and phoned the FAA to request that they take some action. Cumbersome bureaucracy and delay seem to be the rule.

So why then is the FAA not acting? We cannot imagine a more appropriate health issue over which the FAA has authority.

I believe the FAA is both unwilling and unable to act on our behalf because of conflicting objectives. The FAA has the responsibility for the occupational health of cabin attendants and the responsibility to promote commerce of the airlines. The result is that the health issue of flight attendants and passengers' exposure to environmental tobacco smoke is being left unattended by the FAA, even though it has authority to regulate it. And that is why I am here today. I now believe that the decision to ban smoking on international flights should be in the hands of Congress.

This decision cannot be left up to the bureaucracy and politics of the FAA or the vested interests of individual airlines. A strong consensus of the scientific community is that environmental tobacco smoke seriously threatens the health and lives of nonsmokers, particularly in the closed confines of an airline cabin. And make no mistake about it, 250 or more people crowded into an enclosed area for an extended period of time is a public place.

So we are asking for legislation to ban smoking on all U.S. carriers, for health and safety reasons. We are asking Congress to act to protect flight attendants and passengers who choose not to smoke. The time has come; it is the right thing to do.

Thank you.

Mr. OBERSTAR. Thank you very much. We very much appreciate your testimony and the documentation that you have provided. It is very helpful.

[The following was received from Ms. Hagan:]

Testimony - Joyce Hagan - International Flight Attendant May 18, 1994 James Obestar Hearings on Cabin Air Quality. Questions submitted by Congressman Obestar to be answered .

1). Are flight attendants in other countries working on their governments as you are on ours, to end smoking on international flights?

I do not know the complete answer to that question. I have spoken to flight attendants on various foreign carriers about the smoking issues. They would like to see it stopped but feel there is no hope of having that happen.

2). Is the captain generally responsive to your appeals to increase the airflow, or do they just blow you off unless they feel it?

Many, many pilots are sympathetic to us having to work in the concentrated smoke. Others, some of which are smokers, are not sympathetic. There is no consistency in what a crew member or passenger can expect from one flight to another. I had one pilot tell me that he had turned off the recirculation fans all he could and not to bother to call him again. (on the B767, to turn off the recirculation fans causes outside air (fresh) to be circulated.) Yet another captain tell us that if it gets too smoky back there, to call and he would turn on the non smoking sign until the air clears. Every flight is different. Each equipment is different.

3). Would an increased supply of fresh air be the answer, or are there other things that we need to do aboard aircraft to improve the quality of air?

On international flights, banning smoking and increasing ventilation would improve cabin air quality dramatically. No question about it. Cigarette smoke is the single largest complaint by passengers and crew about overall air quality on international flights. As more information about the hazards of smoking become known, more passengers are speaking out and demanding smoke-free air to breath. Drifting smoke is everywhere.

On international flights where smoking is still permitted, there are many variables that determine if the air is 'unbearable' or only 'tolerable'. The problem is, there is no standard set for acceptable minimum ventilation rates for airplane passengers cabins. This is not defined under FAA regulations. (This data collection was requested in 1986 by the NAS study on Cabin Air Quality.)

*I have attached a copy of the NAS Study of Cabin Air Quality from 1986 and highlighted pertinent information. Again we ask the question: How many times do we have to keep identifying the same old problem before the FAA acts?. The FAA's responsibility to "**promote**" the airlines results in the FAA doing only what the airlines want them to do. This is in conflict with the FAA's other critical responsibilities for **health and safety issues.** This is a situation that needs attention and needs to change.*

Some of the cabin variables are:

1). What is the equipment type? New or old?
2). Is the flight full?
3). How many smokers are on board. Of the smokers on board, how many of them are chain smokers.
4). How many smoking passengers have booked non-smoking seats and come to the back of the aircraft to stand near the galleys and lavatories and smoke.

In some aircraft types, clean air comes in the front of the aircraft and exits in the rear of the aircraft. Therefore the rear of the aircraft has the worse air and that's where the majority of the smoking takes place.

(This situation of concentrated smoke in one area poses both a health and safety problem. The buildup of smoke often sets off the smoke detectors in the nearby lavatories. Standing smoking passengers have been known to drop their lit cigarette on the floor or carpeting, and step on it, in an attempt to put the cigarette out. I submitted pictures to document this occurrence. I have asked the FAA to require that smoking passengers be seated in the smoking section in order to smoke, for both health and safety reasons. They refused to act.)

Also pointed out in the 1986 Cabin Air Study was the fact that " ventilation systems on aircraft were designed to control odor and irritation from cigarette smoke on the assumption that smokers are randomly distributed throughout the aircraft. Separation of smokers and nonsmokers into separate sections causes high concentrations of ETS from the smoking section which **cannot be compensated for by increased ventilation** in that section".

A ban on smoking for all international carriers would eliminate health risks associated with environmental tobacco smoke, reduce the possibility of in-flight fires, and bring the cabin air quality more into line with established standards for other enclosed environments. It would also "level the playing field" for U.S. carriers and save substantial costs to U.S. airlines.

Joyce HAGAN Testimony
May 18, 1994

precautions necessary to protect passengers in event of in-flight fires, which produce smoke and fumes. Accordingly, the Committee on Airliner Cabin Air Quality was established in the National Research Council's Commission on Life Sciences. This report summarizes the findings of the Committee's 18-month study of relevant issues. The investigation covered five general subjects:

- Cabin air quality: including potential health effects of reduced ventilation and of contamination by chemicals, microorganisms, other allergens, tobacco smoke, and ozone.
- Cabin environment: health effects of reduced pressure and of cosmic radiation.
- Emergency procedures: control of fires and toxic fumes, use of emergency breathing equipment, and adequacy of emergency instruction given passengers.
- Regulations: regulations established by U.S. and foreign agencies.
- Records: status and adequacy of medical statistics on air travel, of records on airline maintenance, and of records on operating procedures.

The Committee relied heavily on published material--articles in scientific and medical journals and government and industry publications. FAA provided accident data and information on continuing investigations. Members of the Committee also visited government, airline, and industry groups to review fire testing, crew training facilities, and research programs on cabin ventilation. Relevant comments and information were received from the general public and other interested groups at an open hearing and were reviewed by the Committee.

In formulating its conclusions and recommendations, the Committee attempted, but abandoned, the separation of issues of health from those of safety. However, under current statutes and administrative orders, no federal office has direct responsibility for health effects associated with air travel. This lack of correspondence between the issues as conceived by the Committee and the responsibilities of federal agencies

1986 NAS Study of Cabin Air Quality

contributed to the difficulty of the Committee's work. The Committee believes that the health effects associated with air travel should be within the purview of a federal agency.

CABIN AIR QUALITY

In assessing the overall quality of onboard air, the Committee determined the range of outside-air ventilation rates on the U.S. fleet by reviewing manufacturers' design specifications, airline load-factor data, and operating procedures. No data were available on actual measured airflow in the fleet.

The Committee found that, if the lowest rate of ventilation permitted by current equipment design were used under conditions of full or nearly full passenger loads, the resulting ventilation rate would be at the minimum determined to provide acceptable air quality when smoking is not permitted and other contaminant sources are not present. In the absence of sources of contamination, this rate does not constitute a health hazard.

In particular, the Committee noted that the flow rate of outside air varied from below 7 cubic feet per minute (cfm) per economy-class passenger to 50 cfm per first-class passenger. Cockpit ventilation rates are often as high as 150 cfm per crew member; this higher rate, however, is provided to meet avionic and electronic equipment cooling loads, rather than for reduction of contaminant concentrations. These rates compare with a ventilation rate of 5-7 cfm/person established for other types of vehicular travel that have nonsmoking sections, including passenger and commuter trains and subways. It should be noted, however, that these other ventilation standards do not consider possible synergistic effects of the low relative humidity encountered in aircraft.

Another important consideration is the adequacy of oxygen supply--because the normal requirement of air to meet oxygen needs for sedentary people is only 0.24 cfm/person, the amount of oxygen is sufficient in aircraft even at the lowest rate of flow of outside air.

1986 Study on Cabin Air Quality

Nevertheless, a minimal ventilation rate for airplane passenger cabins is not defined under FAA regulations, which specify ventilation rates only for flight crew compartments. Actual cabin airflow is seldom measured once an aircraft is in service; and flow can be reduced by deterioration in equipment performance. A data collection program that measures airflow and contamination in airplane cabins should be implemented.

CARBON DIOXIDE

The Committee's efforts in evaluating contaminant concentrations were hampered by an almost complete absence of reliable data. The carbon dioxide concentration associated with a given ventilation rate, however, can be estimated with confidence. For a rate of 9.7 cfm/occupant, the carbon dioxide concentration would be about 0.15%, or 1,500 ppm. No adverse health effects of carbon dioxide would be noted at this concentration, but the FAA standard for aircraft allows for double this concentration. This is considerably higher than standard concentrations permitted by the Occupational Safety and Health Administration (OSHA) and the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) for other types of indoor environments. The FAA standard is much higher than standards for other confined environments. The Committee recommends that FAA review its carbon dioxide standard.

HUMIDITY

In addition to carbon dioxide, relative humidity in the cabin at flight altitude is predictable, depending only on cabin ventilation rate, passenger load factor, temperature, and pressure. With a range of standard cabin ventilation rates, the relative humidity varied from 23% to less than 2%. After 3 or 4 hours of exposure to relative humidity in the 5-10% range, some passengers experience discomfort, such as dryness of the eyes, nose, and throat. However, the Committee could find no conclusive evidence of extensive or serious adverse health effects of low relative humidity on the flying population that would justify recommending a regulation to add supplementary humidification systems to aircraft.

OZONE

Ozone has been measured at concentrations above 0.8 part per million by volume (ppmv) in the cabin during flight above the tropopause and during periods in which there is increased vertical air exchange between the stratosphere and the troposphere. This relatively high concentration can be reduced if ozone control equipment has been installed and is operating or if altitude and route limitations are imposed. In comparison with the observed ozone concentration of 0.8 ppmv, compliance with existing standards would limit ozone concentration to a maximum of 0.25 ppmv at equivalent sea-level pressure. Standards also limit the time-weighted average ozone concentration for any flight segment of over 4 hours to 0.1 ppmv.

The Committee could find no documentation of the effectiveness of the various methods being used by the airlines to control ozone. Therefore, the Committee suggests that FAA carry out a carefully designed program to ensure that cabin ozone concentrations comply with Department of Transportation regulations.

ENVIRONMENTAL TOBACCO SMOKE

A contaminant in aircraft cabins that can be detected by its characteristic odor and visibility is environmental tobacco smoke (ETS)--the combination of exhaled mainstream smoke and the smoke generated by smoldering cigarettes. ETS is a hazardous substance and is the most frequent source of complaint about aircraft air quality. In the past, ventilation systems on aircraft were designed to control odor and irritation from cigarette smoke on the assumption that smokers are randomly distributed throughout the aircraft. However, separation of smokers and nonsmokers into separate zones is now federally mandated. Because of the high concentration of ETS generated in the smoking zone, it cannot be compensated for by increased ventilation in that zone. Moreover, strict separation of the airplane into smoking and nonsmoking zones does not prevent exposure of flight attendants and nonsmoking passengers to ETS, because of the location of galleys and lavatories in the smoking areas. Smoke exposure can become significant in aircraft with outside-air flow

1986 Study on Cabin Air Quality

6

rates as low as 7 cfm/passenger. Even a ventilation (airflow) rate of 14-15 cfm/passenger consists of as much as 50% recirculated, and possibly smoky, cabin air.

It is not known how often operating procedures are used that can decrease actual ventilation rates and increase contaminant concentrations. The Committee found no published peer-reviewed data on ETS concentrations in cabins. Although the adverse effects of ETS are still under investigation, the Committee feels that this potential threat to the health of nonsmoking passengers and flight attendants should not be ignored, especially because flight attendants on some airlines can fly up to the twenty-eighth week of pregnancy. It is highly probable that eye, nose, and throat irritation will increase among airline passengers as outside-air ventilation rates are decreased and recirculation is increased to improve fuel efficiency.

The Committee considered several ways of reducing ETS concentrations in aircraft. Any solution requiring structural or engineering changes--such as markedly increasing ventilation, moving lavatories and galleys, and separating smoking compartments with physical barriers--appears economically infeasible. Increasing ventilation of the smoking zone to the point where it is in compliance with ASHRAE guidelines and eliminating recirculation on existing aircraft does not appear technically feasible. The amount of air that would be required could exceed the engine bleed capacity and in all cases would reduce the range of the aircraft, the payload, or both. Injection of large volumes of air into the cabin would create unacceptable air velocities and result in passenger discomfort. In contrast, the Committee feels that a return to the random distribution of smokers throughout the cabin to reduce overall ETS concentration would be unacceptable to a majority of the traveling public.

Cigarette-smoking has been implicated in a small number of in-flight fires, and thus presents a potential threat to safety.

The Committee recommends a ban on smoking on all domestic commercial flights, for four major reasons: to lessen irritation and discomfort to passengers and crew, to reduce potential health hazards to cabin crew associated with ETS, to eliminate the possibility of fires caused by cigarettes, and to bring the cabin air quality into line with established standards for other closed environments.

AEROSOLS

Evaluation of the degree of health hazard associated with exposure to biologic aerosols was impossible, because of the lack of data on their concentrations in aircraft cabins. There is an urgent need for studies of potentially infectious airborne agents under routine flight conditions. In the meantime, the Committee's recommendations regarding control of infection through ventilation must be based on similar occupancies (trains and subway cars) for which ventilation standards have been established.

Because a likelihood of occurrence of epidemic disease when forced-air ventilation is not available on the ground has been demonstrated, the Committee recommends that a regulation be established that requires removal of passengers from an airplane within 30 minutes or less after a ventilation failure or shutdown on the ground and maintenance of full ventilation whenever onboard or ground air-conditioning is available.

The Committee also recommends that maximal airflow be used with full passenger complements to decrease the potential for microbial exposure and that recirculated air be filtered (to remove particles larger than 2-3 um) to reduce microbial aerosol concentrations.

The Committee found no studies of the concentrations of other contaminants--such as volatile organic compounds or substances that might be emitted from disinfectants or cleaning materials--and therefore cannot assess their potential health hazard to passengers or crew members.

Because the Committee found only sparse data on air quality and contaminants in aircraft, it undertook to have a multizone computer model of an aircraft ventilation system developed for its use in calculating contaminant, water vapor, and carbon dioxide

Mr. OBERSTAR. Mary Ellen—let's see, Ms. Welker.

Ms. WELKER. Thank you, Mr. Chairman.

I am here on behalf of thousands of international flight attendants who are exposed daily to deadly tobacco smoke. It causes lung cancer, heart disease, respiratory infections; the list goes on and on, you have heard it.

I am here to testify of their impact on commercial airline employees and the flying public. My coworkers and I are developing the serious life-threatening problems brought to light by the EPA and the medical profession.

Within six flights of flying international routes, I began developing frequent and severe upper respiratory infections and bronchitis. On every flight after about a half-hour of work in the smoking section, my eyes became red and watery, my throat began to hurt and would I develop a deep, repetitive cough.

Frequently, this was accompanied by headaches and nausea. It necessitated monthly visits to doctors whose only solution rested in the prescription of drugs. After six months of this continued suffering, I sought out a specialist who determined my health problems were due to my exposure to environmental tobacco smoke.

He provided Seldane, a decongestant and Beconase, a steroid which I am forced to inhale twice daily. I do not like having to take such medications because of the side effects. However, I must do so if I am to continue working in this toxic environment.

My experience is not unique. I have personally spoken with hundreds of flight attendants who have, or know other flight attendants who have health problems similar to mine, or much worse than mine. Lung cancer is one unfortunate example. As flight attendants, we basically have three alternatives to working in the smoke: One, quitting the job; two, taking medication; or, if available, flying domestic routes.

For many, these alternatives are not possible or attractive. First, for most of us, the alternative of quitting our job is just not feasible. Second, alternative, taking medication is expensive. My medication alone costs about $1,100 per year. In addition to the cost, the side effects are unacceptable. Keep in mind, these drugs only work to relieve irritation, they do not protect me from the long-term side effects of inhaling the tobacco smoke.

The third alternative, working on nonsmoking domestic routes would entail vastly different work schedules and a dramatic pay decrease which most flight attendants would not be able to bear. Further, the most junior flight attendants, the reserves, have their schedules dictated to them. They don't have a choice. Many flight attendants are hired for their language skills. They are committed to flying international for a period of time.

Let's not forget that flight attendants aren't the only ones suffering in the smoke. The passengers are as well. On every, single international flight, I see passengers made miserable by the smoke. I feel especially for the little children that cough, their eyes water, their throat hurts, but I can't do anything to help them, because I can't do anything about the smoke.

I recently could do nothing to help a precious four-year-old girl sitting as far away as she could get from the smokers. She coughed and wheezed until she became sick. She was allergic to the smoke.

To picture this: the smokers are puffing away because of their rights to smoke, while she was in the bathroom throwing up, a direct result of their behavior.

Do they really have that right?

What about the businessman with asthma who has to be in Frankfurt for a meeting? What is he going to do? He is going to suffer for 8, 9, 10, even 11 hours. The most I can do is give him a wet cloth to put over his mouth.

And how about the families on their long planned and awaited European vacations? They book their seats in the nonsmoking section under the false pretense that they will be in a nonsmoking environment. There is no such thing as a nonsmoking section in a long metal tube with poor ventilation. There is no way to adequately separate the smokers from the nonsmokers. While the filters are able to remove some of the particulate matter, they cannot remove the carcinogens.

The toxic air is simply recirculated throughout the cabin. Of course, it is much worse in the smoking section. Not only do we have to work it during the meal service, but also frequently our galleys are located in this smoking section.

As you can see, this guy is practically in our galley. And this here is our jump seat back here, our jump seat is attached to this wall. He is right there on top of us. This is an oxygen bottle here. At one meeting a flight attendant told me he saw a passenger put his cigarette out on that. Do you think that would cause a big boom?

And obviously, there is a fire potential back here for dropping the cigarette and that is one reason we have to be back here during the flight, to watch for the fires caused by careless smokers. It is a big problem on night flights. They fall asleep with their cigarettes lighted.

Now, I am not trying to take the rights away from smokers. But the smokers do not have the right to make everyone else in their mutual environment smoke along with them. This is actually what is happening. The individual airlines is reluctant to act alone on a total ban because they fear losing market share, although it has not been proven in market studies. We need you to enact a total ban on smoking to ensure a more equal playing field to pacify the industry.

Congress banned smoking on domestic routes and for this we thank you. We now need you to go one step further and ban it on all international routes into and out of the U.S. for health and safety reasons.

Thank you.

Mr. OBERSTAR. Thank you very much for your presentation.

Ms. Hendrick.

Ms. HENDRICK. Good afternoon.

My name is Donna Hendrick, I am President of the Airline Division of CUPE. Our union represents the majority of flight attendants in Canada.

I thank the committee for the opportunity to testify this afternoon.

In 1985, Statistics Canada revealed that 500 Canadians die each year from the effects of passive smoking. In 1985, Lynn McDonald,

Member of Parliament, recognizing the mounting evidence that secondhand smoke in the workplace damages workers' health, introduced a Private Members' Bill, the No Smokers Health Act to protect workers in Crown corporations, transportation and communications industries.

The airlines began to respond to the growing public awareness of the negative effects of secondhand smoke. In 1971, Air Canada offered passengers the choice of smoking or nonsmoking seats on all aircraft. After more than 200 passenger complaint letters, in 1985, and as a competitive marketing strategy based on the results of passenger research conducted on the Montreal–Ottawa–Toronto high-volume triangle route, Air Canada decided to offer nonsmoking on flights up to one hour and 10 minutes for a three-month trial period. Passengers not only supported these nonsmoking flights, they requested more of these flights, especially ones of longer duration.

This action by Air Canada, which is one of the largest carriers in Canada, prompted the Federal Government in 1986 to announce a smoking ban on Canadian flights of two hours or less. Although the airline carriers have been encouraged by the government to initiate voluntary action, this was rejected because voluntary compliance and voluntary initiatives are not enforceable and can be abandoned at any time.

By April 1988, both Air Canada and Canadian Airlines International, which is the second largest carrier in Canada, had voluntarily become totally smoke-free on flights under six hours within North America. Although both airline carriers have been operating in North America smoke-free successfully for one year, the government enacted legislation in 1989.

In June 1990, Canadian air carriers were required to reduce smoking rows by 25 percent, until aircraft cabins were entirely nonsmoking by July 1, 1993. In October 1990, Air Canada introduced nonsmoking flights to Europe, and this carrier has been totally nonsmoking for almost four years.

Air Canada strongly supported Transport Canada's decision to request that member states of the Council of International Civil Aviation Organization and World Health Organization consider a resolution leading to the eventual elimination of smoking on all international flights by July 1, 1996.

The air carriers have twice requested and received an extension to the implementation of a total smoking ban in Canada. Consequently, the act, the Smokers' Health Act, allows smoking on Asian flights. This extension is scheduled to terminate on July 1, 1994.

After four extensions to a total smoking ban, the airline division of CUPE will mount a major public campaign to compel the government to follow through on its commitment to airline workers.

There have been significant economic savings for the airline companies as well as health and safety benefits for crews and passengers. Air Canada has shown in the first quarter of 1991 that it saved $800,000 in dry cleaning of drapes and shampooing of carpets on aircraft. As well, smoking ban on flights has improved the air quality on aircraft and has reduced the potential health hazard to crews and passengers.

One of the most serious results of smoking is a safety concern. When a passenger lights a cigarette on a totally nonsmoking flight, it can be smelled immediately, thereby preventing the possibility of an on-board fire. Smoking has been condemned by the medical profession as a serious health hazard. Secondhand smoke is recognized as a serious threat to nonsmokers, and airline carriers can save substantial costs with a nonsmoking ban. The world airlines and their related associations are gradually moving towards a greater number of nonsmoking flights. It is time for the government to enact legislation to protect the lungs of humans in a small compressed area such as an aircraft.

Air quality. The problem of poor air quality on aircraft has been a long-standing concern of the Airline Division of CUPE because this issue has serious health consequences for flight attendants and the traveling public.

As a result of numerous complaints from flight attendants, the Canadian Aviation Board on March 14, 1990 issued an Aviation Safety Advisory No. 1388, proposing to assess the quality of cabin air on several aircraft types operating at high altitudes and to determine the effects on the ability of flight attendants to perform safety-related duties. On June 18, 1990, Transport Canada responded to this advisory and agreed to do a one-year testing program of 12 aircraft types. The first aircrafts to be studied would be the E–320 and the B–767.

The premise of this joint Transport Canada/Labor Canada study was based on the preliminary Transport Canada investigation of the F–100 in 1989, which found unacceptable levels of on-board carbon dioxide that could be harmful to humans and create, quote, "a significant problem," end quote.

Based on the results of this early inquiry, it became clear that the cabin air quality standards contained within the aviation occupational safety and health regulations were inadequate, because the limits of exposures to toxins were set too high. A comprehensive study of all aircrafts could correct this regulatory deficiency and provide scientific evidence to allow the Federal Government to set appropriate standards to protect the health of flight attendants and passengers. More importantly, these new standards would establish a scientific basis to monitor future air quality problems.

While this national cabin air quality study was acceptable to our union and the aircraft manufacturers, it was rejected by the airline carriers and Transport Canada in 1992. Instead, air quality tests were conducted as a result of specific complaints and only "to confirm published air quality standards."

This solution is unacceptable. The F–100 air quality tests have already shown that on-board concentration of toxins were in excess of acceptable levels, while at the same time in compliance with "published air quality standards." Consequently, any government investigation of flight attendant complaints would only prove that dangerous and hazardous cabin air quality conditions still exist within Transport Canada's standards. Because the standards were set too low, any complaints could be dismissed by the air carriers and Transport Canada, despite health risks faced by flight attendants and passengers.

In 1992, the Airline Division of CUPE conducted a cabin air quality survey. Slightly more than 70 percent of all respondents reported having problems. From written comments it was clear that many respondents accepted poor cabin air quality as normal and not worth reporting. This attitude has dramatically changed in the last five months. Therefore, the survey results are conservative and underestimate the actual level of cabin air quality problems experienced by flight attendants. Detrimental symptoms were reported by flight attendants of all ages, seniority groups, and both male and female workers.

Some of the more serious symptoms reported by flight attendants were sudden fatigue. Eighty percent of the respondents reported moderate to severe conditions. Seventy-six percent reported moderate to severe headaches and other symptoms includes respiratory pain, dizziness, shortness of breath and faintness. Twenty-four percent of all respondents reported having to take oxygen on board from portable bottles, and 5 percent of respondents missed at least one day of work as a result of symptoms related to the problem of air quality. Our survey results show that the A–320 seem to be the worst culprit, and the B–767 and the DC–10 follow closely behind.

It is also noted that 90 percent of pilots did not address the air quality concerns of flight attendants. Because of the increased economic pressure on the carriers to cut costs, pilots are turning airpacks off or decreasing the amount of fresh air to save fuel.

We firmly believe that a comprehensive air quality study conducted in Canada and the United States would conclusively confirm our survey results and consequently, these findings could significantly improve air quality standards for airline workers, flight attendants and the traveling public.

Mr. OBERSTAR. Thank you very, very much for your presentation, and for the complete addenda documentation with your testimony.

Ms. Miller.

Ms. MILLER. I am Mary Ellen Miller, Director of Safety and Health for the Independent Federation of Flight Attendants, representing the flight attendants at TWA. And with me today is Nancy Garcia, Health and Safety Representative for the Teamsters' Airline Division, representing the flight attendants at Northwest and World.

I will be summarizing my testimony for you.

Although we do appreciate the opportunity to appear before this committee to discuss flight attendant concerns about cabin air quality, we are aware that this is not the first time we have had to bring this and other concerns before Congress. To prepare this testimony we were reminded that this is just one of many issues which have been brought before you because of flight attendant concerns that have not been adequately addressed by the Federal Aviation Administration, FAA.

During 1983 and 1984, flight attendant unions testified before Congress on the very issue under review today. As a result of those hearings, Congress, in Public Law 98–466, mandated that the National Academy of Sciences conduct a study to determine whether air quality and standards aboard commercial aircraft are adequate for health and safety of all who fly.

The Academy published its findings in 1986, and made eight recommendations to improve cabin air. The FAA has not acted on one of them. Only one recommendation has been implemented: The domestic smoking ban, and that was by congressional legislative action.

Despite the NAS report, flight attendant and passenger complaints and documented flight attendant illnesses, the FAA continues to ignore the cabin air quality issue. Industry has not done much better. Just a few weeks ago the Air Transport Association made public the result of their cabin air quality study which concluded that cabin air quality is fine.

But a limited survey of a few short-range nonsmoking flight segments is not what NAS had in mind, nor do we believe it is appropriate to draw conclusions about cabin air quality from such limited data. In short, flight attendants continue to be concerned about cabin air quality, and if anything, our concerns have increased.

Today, you have heard testimony on how reduced ventilation occurs. Reduced ventilation can also occur through flight crew selection of a reduced pack operation. Reducing packs is not a violation of any FAA standard. In fact, the minimum equipment lists allow for an aircraft to fly with one pack inoperative as well as all fans inoperative.

The shutting down of packs is not unique to one airline in the industry. In fact, it is a widespread practice due to the fuel savings generated by the reduction.

For example, you can see from the bulletin in the back of my testimony, issued by one of the major airlines, shutting down packs that when flying a 747, turning off one pack is standard operating procedure after the aircraft reaches cruise altitude.

Further, the bulletin states that pilots are directed to "use gasper and cabin recirculation fans as necessary for passenger comfort." This suggests that fans are routinely shut down.

When you operate with a pack shut down and you shut off cabin recirculation fans, you have compounded the air quality problem. In fact, Boeing acknowledged this problem in a 1993 article for "Airliner Magazine," where they stated: "Whether on the ground or in flight, Boeing does not recommend shutting off the airplane ventilation system when passengers are on board: an exception to this is for no pack takeoffs in which the air distribution packs are shut off for a short duration on takeoff only, but not the recirculation fans."

Boeing also issued a service letter in August 1993 to all Boeing customers, the ATA and IATA. The Boeing service letter discusses the 50 percent fresh air and 50 percent recirculated air to the passenger cabin, which results in 20 to 30 total air changes per hour for the passenger cabin and as many as 80 total air changes per hour for the flight deck.

This difference between flight deck and cabin environments often creates another problem. If you will refer back to the airline bulletin on pack operating procedures, you will see that it directs flight deck crews to be alert and responsive to advisories from the cabin.

On limited occasions, short intervals of three-pack operation may be required to increase circulation. This procedure sets up a potential conflict between the flight deck and the cabin. It makes cabin air quality on any given flight dependent on subjective criteria.

Many years ago, coal miners carried canaries down into the mines to test air quality. The flight attendants should not have to be the canary that detects an air quality problem aboard a modern airliner. A flight attendant should not have to assess air quality and make a case to the flight deck to correct a problem.

It is unfair to place the flight attendant in that position, and frankly, it is also unfair to the captain. Determining air quality standards, monitoring the cabin environment and setting policy and procedures are more properly jobs for the FAA.

The FAA is preparing to lower the current FAA regulatory limit of 3 percent for CO_2 exposure to the OSHA limit of .5 percent rather than the ASHRAE recommendation of .1 percent. The OSHA limit is a worker limit; the ASHRAE number is for public exposure.

In the cabin of an aircraft, it is impossible to separate the workplace from the public place. Consequently, passengers and flight attendants alike will be subject to a workplace limit. We believe that the more stringent standard is more appropriate.

We have heard testimony today on pesticide spraying on aircraft. The spray often is Aerosol Aircraft Insecticide, which earlier was mentioned. It is registered with the Environmental Protection Agency, and it is sold over-the-counter as roach killer.

In addition to passenger complaints as stated earlier in EPA's testimony, flight attendants have also complained that their health has suffered from pesticide exposure. Marilyn Genz, a retired flight attendant, filed suit against the Department of Health and Human Services, maintaining that her health problems, which include liver damage and abnormal clotting of her blood, were caused by nearly 25 years of required pesticide spraying prior to landing.

We are grateful that the Clinton Administration through DOT Secretary Peña has requested that the 27 various governments cease insecticide spraying requirements of arriving aircraft. We also feel strongly that passengers must be notified about the spraying in advance of their flight. Further, flight attendants should be providing information and training on pesticide spraying and should be provided with protective gloves and other protective equipment.

In conclusion, the basic prerequisite to ensure the health and comfort of passengers, flight attendants and flight operations personnel is to provide the highest-quality aircraft cabin air possible to attain.

The lack of flight attendant input into the ATA survey of 35 flights was one of its major flaws. They did not ask flight attendants to identify those flights that may need to be evaluated. Furthermore, they looked at very little that would be helpful in identifying problems.

They went looking for no problems, and they found no problems. They did not investigate wide-bodied international smoking flights, and their report includes only the averages of the few flights they surveyed.

In response to ATA's survey of flights and because we are an employee-owned airline at TWA, TWA jointly with IFFA will conduct a study of selected TWA flights. The selection is being made from flights where flight attendants have expressed concern or experienced problems. We believe the cooperative step that TWA has taken jointly with IFFA is the right one.

I am told also that Northwest is planning also to look at air quality. We hope that Northwest will do that as a partnership with their flight attendants.

The eight years since the NAS report has not resulted in improved air quality. In fact, the trend is for more recirculation. Additionally, only one NAS recommendation was acted upon and that was by Congress. It is time to act on those recommendations made eight years ago.

Thank you.

Mr. OBERSTAR. Thank you very much. We appreciate your very thorough testimony.

I certainly join in your hope that Northwest will do the same as TWA.

Ms. Young.

Ms. YOUNG. Thank you.

Ladies and gentlemen of the committee, my name is Patty Young and I have been a flight attendant for 28 years. For the last 25 of those years, I have been working constantly to have environmental tobacco smoke removed from my work environment.

It took an Act of Congress to ban smoking on most domestic flights and it will again take another Act of Congress to ban smoking on all international flights.

Obviously, Congress cannot rely on the airlines to create a healthy and safe environment for either the flight crews or the passengers, nor can Congress rely on the Federal administrative agencies to set protective standards for health and safety.

The Federal agencies involved include the Occupational Safety and Health Administration, the Department of Transportation, the Office of Federal Contract Compliance Programs and the Federal Aviation Administration. These agencies have been nothing more than prostitutes for big business regarding the tobacco smoke issue and cabin air quality issues.

It is a fact that the airlines are more interested in profit than in the health and safety of flight crews and passengers. Part of the profit motive is to save on the fuel costs of maintaining cabin air quality.

In order to maintain cabin air quality, hot air is taken from the aircraft engines and mixed with cold outside air to maintain cabin temperature. The more hot air taken from the engines, the higher the fuel costs. Therefore, the airlines reduce the amount of fresh air brought into the cabin.

Five years ago, I spoke before a congressional committee, as you know, concerning the ban of smoking on domestic flights. I said to that committee at that time, we the flight attendants are not a disposable work force and we deserve a healthy and safe working environment.

Obviously, I was wrong. We are disposable. The airlines have made absolutely no attempt to improve cabin air quality by ban-

ning smoking on all flights. As a result, the flight attendants are sick, diseased, dying and dead from illnesses caused by tobacco smoke.

We are literally walking time bombs because of the rape we are being forced to endure in our work environment. Even when we do secure a smoke-free environment, we will still be subject to tobacco-related cancers and other illnesses which can take easily up to 20 years to show up.

Some of the effects of my tobacco-related illnesses are chronic bronchitis, asthma, chronic laryngitis, chronic sinus disease with polyps, and severe debilitating headaches with vomiting the diarrhea. Also, when I was forced to work smoking flights, at times my tears and my mucus were the color of coffee or tea. If that was the visible effect, obviously, the tobacco smoke was and is affecting my entire body.

As a result of my smoking-related injuries, I have been determined to be a person with a disability, under Section 503 of the Rehabilitation Act and Title I of the Americans With Disabilities Act. This determination was made by the Office of Federal Contract Compliance Programs within the Department of Labor. Therefore, I represent that class of persons with disabilities that are either caused or aggravated by tobacco smoke. This class of persons with disabilities is either denied access on international flights or forced to accept serious health consequences in order to fly on international flights.

The airlines also believe that in order to protect their market share, it is necessary to pander to their drug-addicted smoking passengers at the expense of the health and safety of flight crews and nonsmoking passengers. This can be confirmed by an examination of AMR, American Airlines Corporation official notice of its annual meeting of stockholders, which is going on as we speak, by the way.

Proposal 5—and I have it right here—a stockholder resolution proposes the elimination of smoking on all American Airlines flights by January 1, of 1995. The Board of Directors of AMR Corporation opposes the nonsmoking proposal and recommends that it be rejected by the stockholders at today's annual meeting.

[The following was received from Ms. Young:]

PROPOSAL 5—STOCKHOLDER RESOLUTION

Dr. James F. Socks, 5003 Deerwood Park Drive, Arlington, Texas 76017, who owns 100 shares of stock, has given notice that he will propose the following resolution. The proposed resolution and statement in support thereof are set forth below. A majority of votes cast is necessary for approval of the proposal.

RESOLVED: "That the stockholders of AMR Corporation hereby request that management in order to protect the health and well-being of its passengers and employees eliminate smoking from all American Airlines flights by January 1, 1995."

REASONS: "The National Academy of Sciences has concluded that environmental tobacco smoke presents a hazard to passengers and crew members, and has recommended a ban on smoking on commercial aircraft."

"The International Civil Aviation Counsel, a United Nations organization, has adopted a resolution calling for a complete smoking ban on all international flights by July 1, 1996."

"The Center for Disease Control estimates secondhand smoke kills an estimated 3,000 adult non-smokers from lung cancer annually and causes numerous respiratory problems in nonsmokers."

"The ventilation rate of fresh air in commercial aircraft is low in order to save jet fuel and thereby reduce operating costs, and therefore the aircraft cabin can contain as much as 50% recirculated air which may contain high levels of smoke containing carcinogens and toxic substances."

"If you agree, please mark your proxy FOR this resolution."

The Board of Directors opposes this proposal.

American Airlines complies with federal regulations prohibiting smoking on all domestic flights less than six hours in duration. In response to customer demand, American has announced plans to begin limited non-smoking flights between New York and London this spring. However, American operates its international flights in an extremely competitive environment in which each carrier must carefully protect its market share. American cannot afford to lose passengers who smoke to other airlines. Your Board of Directors believes that American's adoption of a worldwide non-smoking policy prior to other U.S. and foreign airlines adopting a similar policy would place American at a serious competitive disadvantage.

Vote Required for Approval

The affirmative vote of a majority of the shares represented and entitled to vote is required to approve this Stockholder Resolution.

The Board of Directors recommends a vote AGAINST this proposal.

OTHER MATTERS

The Board of Directors knows of no other matters to be acted upon at the meeting, but if any such matters properly come before the meeting, it is intended that the persons voting the proxies will vote in accordance with their best judgments.

By Order of the Board of Directors,

CD MarLett

Charles D. MarLett
Corporate Secretary

March 31, 1994

Ms. YOUNG. This recommendation by the board of directors comes as no surprise, because in previous statements made by its chairman, Mr. Robert Crandall. When asked by company employees in management leadership meetings when smoking would be eliminated on all flights, Mr. Crandall would smile, light up a cigarette, blow out the smoke and say: Does that answer your question?

In a letter sent to me, a copy is right here, Mr. Crandall has also expressed more concern for the welfare of tobacco workers adversely impacted by the anti-smoking legislation than he has for the health and welfare of his own company's flight crew employees.

[The following was received from Ms. Young:]

AmericanAirlines

R L CRANDALL
CHAIRMAN AND PRESIDENT

August 14, 1989

Ms. Patty Young
4910 West Hanover
Dallas, Texas 75209

Dear Patty:

Unfortunately, I simply cannot make a public statement against smoking on commercial aircraft.

While I could tolerate such a prohibition, a great many of our passengers continue to tell us that long flights -- transcons, etc. -- on a nonsmoking airline would simply be unacceptable. Additionally, of course, no U.S. carrier can go "nonsmoking" internationally since all the foreign flag carriers are much more liberal than we and a higher percentage of foreign than domestic customers smoke.

A second consideration is our community relationships. As I'm sure you know, cigarette manufacturing is a very important industry in many of the states in the Southeast and particularly important in North Carolina -- where our Raleigh-Durham hub is located. Can you imagine the reaction of community leaders -- and the many thousands of people who work for the cigarette companies -- to an antismoking initiative by American Airlines?

As you pursue your efforts, I hope you will consider their impact on others. There are a great many people whose lives and welfare would be adversely impacted by further antismoking legislation. In advancing your cause, I think you should carefully consider the other guy's point of view.

In any event, I cannot do as you ask because doing so would damage our stockholders, our business and ultimately, many of our employees. We shall not oppose the spread of no-smoking legislation -- since I can understand the desire of many to avoid smoking's passive effects -- but we cannot advocate it.

Very truly yours,

eh

Ms. YOUNG. As a result of the total abdication of responsibility by Federal agencies, flight attendants were left with no resource other than a worldwide class action lawsuit against the tobacco companies. This lawsuit was filed in State court in Miami, Florida, by Stanley M. Rosenblatt.

As you just said a moment ago, flight attendants can be best compared to the canaries in the coal mines, nothing more than a disposable work force, subject to the "company store" mentality of their employers.

Therefore, Congress must act immediately to eliminate the hazardous flying environment by eliminating smoking on all flights. I would like to thank Miami GASP (Group Against Smokers Pollution) for helping to send me here, to give you this speech.

Mr. OBERSTAR. Thank you very much for your forthright and courageous statement, and coming a second time before our committee——

Ms. YOUNG. Third time, totally.

Mr. OBERSTAR [continuing]. And speaking forcefully and forthrightly on this issue, as all of you have done today.

I agree with our long-time committee staff member, Sterlyn Carroll, whose daughter is a flight attendant, of all of the testimony he has heard over the years, this is the most important, and Sterlyn speaks rarely, but speaks words of wisdom.

You are asking Congress to take action on international flights I assume on smoking, as we have already dealt with that issue on domestic flights.

You heard the testimony from the previous panel, the Department making these overtures to other countries, trying to arrange quadripartite agreements, regional agreements or agreements with certain groups of carriers, and talking about months and maybe years of negotiations and discussions. If we acted unilaterally and just imposed that requirement on U.S. carriers on international flights, prohibiting all smoking, what do you think would be the competitive effects of such an action?

Anybody have an observation?

Patty.

Ms. YOUNG. Well, this is a worldwide movement right now, and it has been for quite a while. There are what, 40 or 50 countries that are nonsmoking domestic, several airlines are nonsmoking worldwide. This is happening more every day. It is not a new phenomenon. This is a human rights issue, a civil rights issue and an environmental rights issue.

My girlfriend died a couple of years ago, I talked to you about her the last time I spoke, Carol Coy. She had her first baby, and she had pains, and went in again to the hospital right after the baby came. They cut her lung out and she died a couple of years ago of lung cancer.

How many dead bodies do we have to have as crew members?

Like I said, we have 20 years for all crew members worldwide to see if they are even going to live through this rape. I say rape, and the definition is, by the way, "outrageous violation." It is an outrageous violation that we are forced to breathe a class A carcinogen because someone wants to be a drug addict at 30,000 feet.

83-115 O - 94 - 5

My other girlfriend had her sinuses cut out three years ago. They took out two handfuls of polyps inundated with tobacco smoke. When they took her sinuses out, her nose fell in. Now she has splints underneath to give herself a nose and she will never fly again. And she has been harassed by even claiming this as an injury on duty, as have both of my friends that have lung cancer and had lung cancer.

Mr. OBERSTAR. Ms. Welker.

Ms. WELKER. I agree with Patty.

I also—the airlines are reluctant to ban smoking. They are desperately afraid of losing any market share. They are afraid of losing the smokers to another airline.

The truth is, it hasn't been studied. They don't know for sure that that would happen. We do know that they would save money on cleaning the airplanes, changing the air filters, they would save money on the medical cost of flight attendants. I am not sure that those savings would outweigh losing a few smoking passengers.

And passengers tell me, they get on international flights and they don't know they are smoking. Oh, I thought it was nonsmoking. I am going to fly Air Canada next time.

And I have talked to people who have flown from, say, Atlanta up to Canada and taken that flight over to London, even though they could go directly to Atlanta–London. So they are losing those passengers.

Mr. OBERSTAR. During the hearings on smoking aboard domestic flights, I am quite sure we heard every argument against a ban, every economic argument, every argument for more study and more analysis, and so on. And although we fell short by one vote in this committee of banning the smoking, we knew that if we took it to the Floor we would win, and we did, on the House Floor.

And now the results are in. It is very clear. It is a happier, healthier environment, and at least one carrier that chose to precede even the two-hour ban found that it attracted passengers. It don't lose passengers, they attracted passengers. And at least it was a wash, and maybe a net gain for that carrier, which just happened to be Northwest before its current management.

I did propose to that previous management that they voluntarily end smoking on flights, just say, we won't do it, be a leader in the industry. Oh, no, they said, can't do that, we will lose passengers. That is they saw the activity heating up in the Congress, they tried to jump the gun and they moved ahead on their own and they found that it was a benefit.

I should think the same effect would—the same result would be obtained on international flights. If you are concerned about being caught in a 2- or a 4-hour flight, think about a 10- or a 14-hour flight. Wouldn't you want to have a good, clean cabin environment, free of environmental tobacco smoke?

I heard all of the arguments by the advocates for smokers, they can choose not to fly. They can——

Ms. HAGAN. Even the smokers do not want to sit in the smoking section. They will book a nonsmoking seat on my carrier and then will walk to the back of the aircraft and smoke their cigarette and then walk back into the less smoky environment of the nonsmoking section.

The majority of passengers do not smoke. So the airlines would have a greater pool of people to choose from. If the smokers want to go to Lufthansa, British Airways, let them go. We will take the nonsmokers.

Mr. OBERSTAR. Just like security aboard international flights. Our passengers are lined up in Germany for a Northwest flight, standing in line right across the aisle is a sign at a Lufthansa counter: Tired of waiting? Fly us.

Well, you know, we haven't seen an exodus of folks to go to a different standard of security, and I don't think you will see an exodus of people to go to a lower standard of health.

Do any of you on the panel find comfort in the response from the Department to my question about the negotiations with other countries on a bilateral that would end smoking on international flights between our countries?

Ms. WELKER. Not at all. The truth is the ICAO agreement has no teeth whatsoever. They rely on what they call "moral suasion." I believe the German airlines have already indicated that they probably would not go along with a total ban, and since they don't have to, well, then neither do the American carriers. They may not go along on a ban on competing routes. I believe maybe even the British carriers say that they don't want to go along with the ban? Is that right?

Ms. HAGAN. We are not making progress in Europe at all, and it was interesting that the FAA and the DOT picked Australia and Canada as their first choices.

Mr. OBERSTAR. Pushovers, I thought.

Ms. HAGAN. Yes, they are pushovers.

By the way, these are candy cigarettes that I found in a department store in the children's section last week in Frankfurt, Germany. Candy cigarettes, and there was a sellout. The kids were happy imitating their smoking parents.

So my point is, I do not think ICAO is going to work for many countries within Europe, Germany included. They are light years away in their thinking on smoking and health.

Mr. OBERSTAR. We haven't seen candy cigarettes in American stores since I was a child.

Ms. HAGAN. I remember these. They had something similar to these when I was a child. But has anyone seen them lately? I have not. Not in the United States.

Mr. OBERSTAR. Mr. Horn.

Mr. HORN. Thank you very much, Mr. Chairman.

Is someone with you from TWA at all?

Yes, I thought you were, Ms. Miller. That is one of my favorite airlines.

Ms. MILLER. Since Carl Ikon is gone, it is one of your favorites, right?

Mr. HORN. Well, I had a few hundred thousand miles before he went. But it is a fine airline. You are employee-run?

Ms. MILLER. Yes.

Mr. HORN. Why haven't you banned smoking on international flights?

Ms. MILLER. The airline has the same sort of economic concerns. It is a chicken-and-an-egg argument here where they are waiting

for the government—for the FAA to take some sort of lead in it, and unfortunately, no one wants to be the leader.

Mr. HORN. And yet, I think Ms. Hendrick, you ought to be congratulated. Canada was the leader. You increased market share; is that not correct?

Ms. HENDRICK. That is correct.

Mr. HORN. Have you done surveys to see if that was related to the ban on smoking?

Ms. HENDRICK. Before I came here—the company as a whole is very receptive to this. They want to ban worldwide. I asked them for specific stats, because we have been saying to the carriers for years that if you use your marketing strategies correctly, you will get passengers.

I just wanted to comment on an earlier statement that the Chair was talking about. I flew a lot of the international flights when Air Canada in 1992 banned smoking on overseas, and it was extremely surprising to me that I ran into many smoking passengers who wanted to go on a nonsmoking flight because they told me that the only way that they would not smoke is on a nonsmoking flight and they hated smoking in a small tube.

Mr. HORN. Let me ask you, not that you will have any great statistical data on it, but just people, people on crews do talk to each other. I am curious, do the pilots suffer from the same degree of illnesses as the flight attendants? Any feel for that?

Ms. MILLER. I would say that although the comparisons haven't been made and there is no good statistics on flight attendant illnesses, the State of California did in 1979 look at the rate of flight attendant illnesses within California at the time, and respiratory illnesses were 20 percent higher than the general public. It was also high for flight deck crew members.

But because as we have said, their air exchange is different there; they don't have as much passenger exposure, they are not in the smoking section of an airplane. Their exposure is far more limited than ours is, and I am sure just by anecdotal information that ours is higher.

Mr. HORN. It is a different environment.

Ms. Young.

Ms. YOUNG. If I could comment, please.

I have literally spoken to hundreds and hundreds of flight attendants who were told they have the lungs of smokers after they—they were nonsmokers after they had their X-rays. Also, I had to have a partial hysterectomy several years ago. I put it off for at least 10 years with incredible pain the whole time.

I had to call to get the okay for the hysterectomy from the insurance company, they said to me, quote: "Ms. Young, something is very, very wrong with your job. You flight attendants are having hysterectomies 20 to 30 years before you should even consider having them, much less have them."

Mr. HORN. That is very a interesting point.

Now, have you followed up with some individuals to see if a survey could legitimize that?

Ms. YOUNG. Oh, definitely. I am a motor-mouth. I was the first person to work to get smoking off the airplane. I would come up on Congress on my days off, talk to the Senate, the House Mem-

bers and they would say, you are just the cutest little old thing. In your dreams. That won't happen. You will never get smoking off the airplane.

I have talked to everybody, I have talked to many flight attendants from ages 27 on up that have had hysterectomies, and it didn't run in their family. I mean, we are sponges. We could have sinus cancer from tobacco smoke, throat cancer, lung cancer, cervical cancer.

Smoke just doesn't go to one spot, or it doesn't end right here, like so many tobacco people would like us to think. I sometimes don't wear any makeup and that is when I would find out that my tears were the color of coffee and I would wipe my face off because it was stinging so much on the airplane and that is how I could see that the tears were the same color of coffee.

Mr. HORN. I have had some of the same experience and what annoys me is that they divide the line down the middle of the plane with the smokers on one side and nonsmokers on the other. These are countries that are supposed to be known for their intelligence and if you ever saw idiocy like that, I couldn't believe it.

Ms. YOUNG. This is unconscionable. We have worldwide catastrophes all the time. This is a catastrophe that the world is just clapping on. It is just ludicrous that this is still being discussed when it has been shown that it is a classic carcinogen.

Ms. MAKI. I would like to say that the 21 carriers that we represent, I don't know of one airline that doesn't harass the flight attendants on sick calls.

Ms. YOUNG. Oh, it is terrible.

Ms. MAKI. We have companies that only let flight attendants call in sick three or four times a year, and the flight attendants are forced to fly ill. And I am sure a lot of that has to do with the environment that they are working in. And you don't hear them harassing pilots, so I don't believe the pilots have the problems that the cabin crew do.

Mr. HORN. Well, I know what you go through. It is a terrific job and do you a wonderful job.

Any other comments on that query?

Well, Mr. Chairman, I am not going to pursue this given the fact that we have a vote and you would like some more questions.

I just want to say to you; I am 100 percent with you. That smoking has annoyed me since I probably put straw in a corn cob pipe that I found in our garage when I was eight years of age, so I am very sensitive to it on airlines, and I don't even want to smell the stuff after they have cleaned the cabin 10 times.

So God bless you in your efforts.

Mr. OBERSTAR. Thank you very much.

We will certainly pursue relief as we have done in the past on this subject.

Ms. Cantwell.

Ms. CANTWELL. Thank you, Mr. Chairman.

I don't have any direct questions at this point in time, but as somebody who has flown over 100,000 miles in the last year, coming back and forth to Congress, and representing a part of the country with airplane manufacturers, they are always looking at the issue of metal fatigue. Well, to me this is an issue of mental

fatigue, worrying about the quality of air in airplanes as we travel back and forth, beyond the smoking issue, just the general quality of air.

And it is not just those working that, particularly you, who have to work in this environment every day, what are the real effects. And I think we need to get this question answered.

Thank you, Mr. Chairman.

Mr. OBERSTAR. Thank you.

Mr. Clinger.

Mr. CLINGER. Thank you, Mr. Chairman.

And I am sorry that I was not here to hear your testimony. I just have one question, because I know you are really the ones on the firing line and you give the best possible anecdotal evidence of what the problems are because of your experiences. Maybe you can shed some light on this.

Now that we have banned smoking on all domestic flights, has it made a difference? In other words, is the quality of air, in your view, now acceptable, or is there something more we really should be doing to render it better?

In other words, have we made enough progress that we don't need to go further?

Mr. WITKOWSKI. Mr. Clinger, can I answer that question?

Mr. CLINGER. Sure.

Mr. WITKOWSKI. The earlier panel from the FAA made reference to a couple of studies that they claimed showed that there was really not a health problem that could be related to cabin air quality. One of the studies that they cited was the GEOMET study which came out in 1989 sponsored by the Department of Transportation.

The principal investigator of that study was Dr. Nagda, N–A–G–D–A, and last year in July before Chairman Valentine's Subcommittee on Technology, Environment and Aviation, Dr. Nagda, who is principal investigator of the study, and thus speaks with authority as to the results of that study said, and I quote: "That sampling in the GEOMET study for fungi and bacteria was conducted only once every flight, towards the end of the flight." Similarly, because of resource constraints, sampling for viruses was not conducted at all. And quote: "Given the limited nature of sampling for microbial aerosols, it is not possible to make any inferences concerning the possibility of transmission of bacterial or viral agents."

So I would like to say that future references to the GEOMET study, saying that it implies that there is not a problem with microbial aerosols in flights, is really not accurate since the principal investigator just stated this last year in testimony—and I have a copy of it.

The only other thing that was referred to was a study by NIOSH about a Western U.S. airline, and I have a letter in my office files from Aaron Sussell of NIOSH. In his letter, he said that the NIOSH study was only on one airline, on one type of aircraft, with just a few flights tested. And he said that it was inappropriate to generate or take from that study any inferences relating to the condition of air quality on the U.S. commercial airline fleet.

So I have that document and I could submit a copy for the record afterwards.

The other thing that I wanted to mention was that there is a proposed OSHA standard now calling for 800 parts per million of carbon dioxide, as an action standard or a check standard to investigate problems with the heating, ventilation and air-conditioning systems. That is a drop from 5,000 ppm, which is the current standard at OSHA.

Now, it is a NPRM, so it hasn't been finally ruled on. But all of the studies, the GEOMET study and the findings I think at ATA, all were in excess of 1,000 ppm, parts per million of carbon dioxide.

One other thing—I was at the press conference for the ATA, Air Transport Association, results of the air quality study, and during that conference, they took samples of carbon dioxide in the air and they said that the samples that they took were approximately comparable to what they found on an aircraft.

I think it was inappropriate, you know, to test the air in a room where you can get up and walk out if you are feeling a little uncomfortable, and I did feel it was a little stuffy in there. But you know, I think that it is inappropriate to use an open space where you can walk in and out, as opposed to an airplane cabin which is a confined space; you are up there from anywhere from 30 minutes to 15 hours. You can't get off the plane. The only thing you can do if you are a knowledgeable passenger is to request one of the flight attendants to go to the cockpit and see what they can do, such as turning on a pack if one of them is turned off on a wide-body that has three packs. But you never know whether the pilot is going to do it or not, because he is under no obligation to do it.

We have submitted for the record documents indicating that the airlines are either encouraging or directing their flight crews to keep the packs on low up to a certain level of passengers. But the National Academy of Sciences study did recommend that on full flights the airpacks be kept on maximal flow. And that is one of the recommendations that was referred to by Mary Ellen Miller that hasn't been acted on by the FAA, and we think it is high time that some action was taken.

Mr. OBERSTAR. We have regrettably three minutes remaining on the vote on the House Floor right now and we are going to have to run over.

I don't want to keep you longer. I want to ask questions that you can submit for the record.

First, are flight attendants in other countries working on their governments as you are on ours, to end smoking on international flights?

Second, is the captain generally responsive to your appeals to increase the airflow, or do they just blow you off unless they feel it?

Third, would an increased supply of fresh air be the answer, or are there other things that we need to do aboard aircraft to improve the quality of air?

I will leave you with those thoughts, and thank you very much for your presentation and assure you that we will continue to work vigorously on this, especially the issue of international flight smoking where I think we must move faster than this administration is proposing to do. Even though they have only been in office for a little over a year, I think it is time enough to take an action. And we will press forward vigorously on that subject.

Ms. YOUNG. Mr. Oberstar, can I please just say something quickly?

Again, I am a disabled American. I am being denied access to not only fly as a crew member on these flights that are smoking, but I represent that class of people who have respiratory disabilities. We have wheelchairs on aircraft now. We never use them, but we have them on there for the people that need wheelchairs. But I am being denied access because I am disabled.

My disability was caused by the tobacco smoke ingested, so I am having to reexplain myself here. So I just want you to know that. The legal ramifications of that are very great.

Mr. OBERSTAR. I certainly appreciate that.

Thank you very, very much.

The committee will stand in recess for approximately 40 minutes.

[Recess.]

[The following was received from the Association of Flight Attendants (AFA):]

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION
SUBCOMMITTEE ON AVIATION
hearing on
Airliner Cabin Air Quality
May 18, 1994

Association of Flight Attendants (AFA) response to Chairman Oberstar's questions on transcript page 186:

1. Are flight attendants in other countries working on their governments as you are on ours, to end smoking on international flights?

AFA answer: Flight attendant unions in other countries have been working very hard to get their governments to ban smoking on international flights. These are the Syndicat National du Personnel Navigant Commercial in France, the Flight Attendants Association of Australia, and the Canadian Union of Public Employees.

The policy of the International Transport Workers Federation (ITF) which includes the world's largest association of flight attendant unions, is to end smoking on all international flights. ITF has campaigned vigorously before ICAO (International Civil Aviation Organization) for a smoking ban on international flights.

2. [Are airliner] captains generally responsive to flight attendant requests to increase the airflow or not.

AFA answer: Generally not. If an airline pilot is flying an airplane on which he is able to turn on a third airpack or to increase the flow of fresh air from an airpack, there is no telling whether the pilot might increase the fresh air flow or not. Despite complaints from the flight attendants about the air in the cabin, the pilots are often hard to convince because of the much higher flow of fresh air per person that they enjoy in the cockpit and the encouragement or direction they receive from their company to minimize fresh air flow whenever able to do so.

Even if the pilot increases the flow after a complaint, he or she may reduce it after a short period of time. The pilot may have to explain or justify to the company the amount of fuel consumption which will increase somewhat if fresh air flow is increased. Pilots don't have to answer to the FAA on this issue because there are no federal standards requiring a certain amount of cubic feet per minute per person (cfm) of fresh air in the airplane cabin, other than the amount necessary to adequately pressurize the plane. The major influence driving down the quality of cabin air is from the company to reduce costs. When the flight is over, pilots must answer to the company, not to the flight attendants.

3. Would an increased supply of fresh air be the answer, or are there other things that we need to do aboard aircraft to improve the quality of air?

Certainly, federal standards must be adopted in order to set a minimum standard for more fresh air in airliner cabins than is currently being provided. This will reduce the concentration of contaminants to which flight attendants and passengers are exposed. Such standards would assist airplane engineers in designing future aircraft with a healthier cabin environment than will otherwise be the case if nothing is done now.

Furthermore, the National Academy of Sciences recommended in their 1986 study, The Airliner Cabin Environment - Air Quality and Safety, that maximal airflow be used with full passenger complements to decrease the potential for microbial exposure. FAA has not acted on this.

The recent Aircraft Cabin Environmental Survey conducted by the Harvard School of Public Health concluded that ASHRAE 62-89 (American Society of Heating, Refrigerating and Air Conditioning Engineers) ventilation standards for offices are not being met in airplanes with recirculating ECUs (environmental control units). They found that overall bacterial counts on planes with recirculating air handling systems tended to be higher than those for 100% fresh air planes. Included in the dust samples were cat and mite antigen and endotoxins, which can account for some of the adverse symptoms flight attendants and passengers complain about.

High efficiency particulate air (HEPA) filters used on airplanes with recirculated air can remove a high percentage of airborne particles, including bacteria. But they are ineffective against single viruses. They also do not remove any gaseous contaminants such as carbon dioxide, carbon monoxide, solvent toxins, or the gaseous products of cigarette smoke. And maintenance is important. If the HEPA filters become overloaded, flow through them will be reduced. Increased air contamination is the result.

Although further research should be conducted on poor cabin air quality problems, we know enough today to justify requiring more fresh air in airplanes than is currently provided.

Attached are several letters describing some problems faced by flight attendants and passengers when they fly.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
National Institute for
Occupational Safety & Health
Robert A Taft Laboratories
4676 Columbia Parkway
Cincinnati OH 45226-1998

December 9, 1993

COPY

Letters to the Editor
Conde Nast Traveler
360 Madison Avenue
New York, New York 10017

Dear Editor:

In your December 1993 article on commercial aircraft cabin air quality, "The air you share up there," Drs. Barry and Cullen correctly noted that modern aircraft are typically designed to recirculate a significant percentage of the passenger cabin air to reduce fuel consumption and operating costs. However, the statement "As for the rumor that airlines are further reducing the flow of fresh air, leading to a decline in conditions, a study conducted this year by the National Institute for Occupational Safety and Health (NIOSH) showed no change in air-quality measures from previous studies" is misleading.

A comprehensive study of air quality in the airline industry has not been conducted by NIOSH. The NIOSH health hazard evaluation (published in 1993) had a very specific objective: to evaluate potential exposures which could be responsible for reported employee illness incidents aboard flights on *one type of aircraft, and on one airline*. Cabin air quality monitoring results for several flights (in 1990) were generally consistent with previous studies, and no plausible environmental source for the illness incidents was identified.

However, it was recommended that the airline consider installation of continuous carbon dioxide monitoring devices in selected aircraft for the purpose of gathering more information about cabin ventilation efficiency during routine flights. Additionally, we recommended that fresh air ventilation be increased while aircraft are sitting at the airport gates, when cabin ventilation was found to be at a minimum.

Sincerely,

Aaron Sussell

Aaron L. Sussell, M.P.H., C.I.H.
Industrial Hygienist
National Institute for Occupational
Safety and Health

72611.002

FISCAL YEAR 1994-1996 FAA R&D AUTHORIZATION

HEARING

BEFORE THE

SUBCOMMITTEE ON TECHNOLOGY, ENVIRONMENT AND AVIATION

OF THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRD CONGRESS

FIRST SESSION

JULY 29, 1993

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CONTENTS

WITNESSES

APPENDIX

Mr. VALENTINE. Thank you, Doctor.

Dr. Nagda?

Dr. NAGDA. Thank you, Mr. Chairman.

Mr. Chairman and members of the subcommittee, my name is Niren Nagda and I'm a vice president with ICF Incorporated, a subsidiary of ICF Kaiser International.

I was the principal investigator of a study sponsored by the U.S. Department of Transportation entitled, "Airliner Cabin Environment." The study was conducted in 1989 when I was with GEOMET Technologies, Inc.

The purpose of the study was to develop information to be used for determining health risks from exposures to environmental tobacco smoke, or ETS, for nonsmoking airliner occupants. Determination of risks from other pollutants of concern was also an objective, but the main focus of the study was ETS. As smoking has since been banned on most domestic flights, I would like to talk about other contaminants that were assessed in the study.

First of all, although the current concern is about airborne contaminants, the greatest environmental risk to cabin crew and passengers is from exposure to cosmic radiation. Given that practical engineering solutions to reduce this risk are not available, exposure management is the only viable option. In the case of crew members, this strategy would involve careful scheduling of personnel to avoid persistent exposure to higher cosmic radiation levels generally associated with high altitude flights and flight paths toward extreme northern and southern latitudes.

Now let me talk about the contaminants other than ETS that were measured in this study. Our study found that the levels of carbon monoxide and ozone were lower than the applicable standards. The levels of fungi and bacteria, for which there are no standards, were lower than similar—lower than or similar to those encountered in other environments. The levels of carbon dioxide were frequently above the level recommended by ASHRAE to satisfy comfort criteria. I will expand on each one of these contaminants.

The average concentrations of carbon monoxide on nonsmoking flights were about one-half part per million with peak concentrations about 1.3 ppm. These levels are considerably below the ambient air quality standards.

My reason for mentioning these results is that articles about our study have appeared in the press which have mentioned high concentrations of carbon monoxide and ozone were reported in our report. Actually, the average ozone concentrations encountered were below 0.02 parts per million, which is considerably below the FAA's three-hour standard of .1 ppm or EPA's standards of .12 ppm.

Because of the need to be unobtrusive in the study, only integrated measurements of ozone were conducted; thus, only average levels of ozone—only average levels of ozone were measured and peak concentrations could not be noted. However, given the low concentrations that were encountered, I believe that ozone should not be a problem in the airline cabin environment.

The levels of fungi and bacteria were low relative to those measured in other environments, such as in homes. It should be noted that because of the need to conduct unobtrusive, unannounced monitoring, sampling for fungi and bacteria was conducted only

once every flight and toward the end of each flight. Similarly, because of the resource constraints, sampling for viruses was not conducted. Given the limited nature of sampling for microbial aerosols, it is not possible to make any inferences concerning the possibility of transmission of bacterial or viral agents.

The average level of carbon dioxide was 1500 parts per million, or 50 percent greater than ASHRAE's comfort criteria. The measured relative humidity levels were quite low, below 25 percent—below 25 percent for about 90 percent of the flights. Low humidity levels are undesirable from a comfort perspective, as they contribute to eye and upper airways irritation.

The levels of carbon dioxide were below ACGIH's recommended level; however, the ACGIH level is not applicable as the airliner cabin environment cannot be considered as an industrial environment. Like ozone, only time-integrated measurements of carbon dioxide were performed due to study constraints.

Carbon dioxide is not a contaminant, but it is a surrogate for indoor air quality and an indicator of general adequacy of ventilation. That the levels of carbon dioxide were high indicates inadequate ventilation of airliner cabin environment with outside air. The ventilation rates in airliner cabins are quite high as compared to other environments, but because of a much greater density of people per unit volume, even those high rates are not always sufficient to provide adequate ventilation.

The situation is obviously very poor when the flight is full and the aircraft recirculates the cabin air. In an aircraft with air circulation rate of 25 to 50 percent, the fresh air rate per passenger is generally in the range of 9 to 14 cfm. This can be compared with 15 to 20 cfm in aircraft without recirculation. As a point of comparison, ASHRAE's standard for 62-1989 recommends 20 cubic feet per minute of outside air for office environments in buildings such as this. Although there is no specific information available, the possibility of transmission of diseases and infections may tend to increase in environments with lower fresh air rates.

Given the concern about transmission of infection and diseases, and the fact that carbon dioxide levels in seven out of eight flights exceeded ASHRAE criterion, further research should be done to investigate links between reduced ventilation rate and potential for increased transmission and incidents of infections and diseases. Similarly, research on problems of eye and upper area irritation and headaches due to reduced ventilation rates and low humidities is desirable. Until results of such studies are available, it would be prudent to increase airliner cabin ventilation rates whenever and wherever possible.

Mr. Chairman, thank you for the opportunity to appear before you, and I will be happy, again, to answer any questions that you have.

[The prepared statement of Dr. Nagda follows:]

May 18, 1994

Association of Flight Attendants

This letter is being written as a complaint about airplane cabin air quality.
My career as a Flight Attendant has spanned almost 17 years. During this period of time, I have had ongoing and recurring chronic bronchitis, acute sinusitis, upper respiratory tract infections and a condition of general malaise (Chronic Fatigue Immune Dysfunction Syndrome).
I was healthy as a child, adolescent, and teenager. It was not until I began my flying career that I began to suffer from ill health. These respiratory/health problems have gradually worsened over the years that I have been employed as a Flight Attendant.
Currently, I am under a physician's continuing and perpetual care for the above mentioned illnesses. During the past 4 years, I have been forced to remain out of work for extended periods of time (medical leaves) because of these health problems, which I feel are directly related to (if not indeed caused) by ~~to~~ the poor cabin air quality on airplanes. At present, I am on yet another medical leave because upon returning to work from my previous medical leave (last year), I again suffered from ill health caused by work-related conditions. (upper respiratory tract infections, bronchitis and influenza). Between the months of November 1993 and February 1994, I contracted four (4) upper respiratory infections and related illnesses. These health problems occur ONLY when I am working flights.
Needless to say, my financial resources have suffered dearly over these last few years.
Travelling is already unhealthy as it is: (poor diet/nutritional sources, erratic sleep patterns (Circadian (body-clock) rhythm disruption), jet-lag, and countless other contributing factors, including toxins from hotel rooms and environmental

pollutants, exposure to higher levels of radiation at higher altitudes; the list goes on and on. Why must the air we breathe be compromised? We are on airplanes much more frequently and for longer periods of time than the flying public. The airplane is our "office" or "home away from home", so to speak. Why must we suffer even more than what are already a myriad of ill-health contributors, (in respect to this unique profession) by being forced to breathe air that has been compromised and is unhealthful? It's like adding insult to injury.

P.S. I was ordered by the California State Disability Office to seek the advice/opinion of another medical professional. Dr. Douglas Hill was appointed that position. He told me that I should quit flying because of the poor air quality on airplanes.

Dr. Douglas Hill
330 Oxford St. Ste. #108
Chula Vista, CA 91911

May 20,1994

Airline Attendants Association
1625 Massachusetts Avenue
N.W. Washington, D.C. 20036

Air Safety and Health Department
Mr. Chris Witkowski

Dear Sir,

On January 29, 1994 my wife and I flew American Airlines from Islip MacArthur to Raleigh Durham, then to Orlando, Fl. Several weeks later she developed a sore throat and constance fatigue. Cold remedies of over the counter type did not help. My wife is 78 years of age.

We made an appointment with Dr. Muhammad M.Siddique of 937 Barefoot Blvd, of Barefoot Bay, Fl.32967, Telephone Number 407 664 4349. His diagnosis was pnuemonia and had her admitted to Sebastion Hospital immediately for a stay of nine days and then discharged. Previous to leaving East Hampton, N.Y. she was feeling well.

On February 1992 after flying American Airlines from Islip MacArthur, to Raliegh Durham, then to Melbourne, Fl. I came down with Upper Respiratory Infection, I was treated by Dr. Thomas Netter of Doctor's Clinic who prescribed Anti Biotic medication, at this time he said, "I can't understand why so many of my patients from the North come in with simiiliar upper respiratory infections." I am 81 yaers of age. I was amazed that Airlines use recycled air in their cabins. It is unfortunated to cut expense to provide fresh air, my total hospital and Doctors visits for my wife was over $11,000. Again Medicare must pay 80% of my expenses.

yours truly.
Otto Roman

135 Pembroke Dr.
East Hampton, N.Y.
11937-3025

Carmen J. Finley, Ph.D., C.G.
4820 Rockndge Lane
Santa Rosa, CA 95404

Research Psychologist

17 May 1994

Meg Leith
Association of Flight Attendants
Air Safety & Health Department
1625 Massachusetts Avenue NW
Washington, D.C. 20036

Dear Ms. Leith:

Thank you for your prompt reply and for sending the ATA Airline Cabin Air Quality Study. Speaking as a research psychologist, there are two very obvious flaws in the design of the study, and one other that I seriously question.

First, the flight times ranged only from 25 to 40 minutes (text on p. 2-2 says 40 minutes, but table in appendix A says 25 minutes) to 5 1/2 hours with a median of 1 hour 40 minutes, in a very skewed distribution. This does not take into account any overseas flights which average considerably longer, often taking two to three times the amount of time of the longest flight time actually sampled. I strongly suspect that some individuals who would escape any ill effects from a relatively short flight would not do so on a longer overseas flight.

Second, there was no attempt to measure viruses in the air because, "sampling for viruses is technically impracticle (sic) at this time." Of all the possible variables that could be measured, I suspect this one would be near the top of those most potentially dangerous. So while the variables which were measured may well have fell within recommended OSHA and ASHRAE standards, the most important variable was not included in the study. In addition the OSHA and ASHRAE standards were developed for "a variety of workplace contaminants and noise," and were "determined by the need for them, and conformance to this is completely voluntary." Using standards of any kind assume the population on which they were developed is like (representative of) the population which is measured against them. One question which immediately comes to mind is whether, in either set of standards, any airline cabin air data is a part of the

standards. If not, what is the population against which airline cabin air is being compared? And what is the justification for using them?

Third, an N of 35 which is divided by four airplane types seems like a very small sample. In addition, the sample was one of convenience, i.e., "were selected based upon aircraft and air carrier availability." While I am not a sampling statistician, I rather suspect a good sampling statistician could really blow holes in the design of the sample, as well as the design of the study itself. I can make a recommendation or two if AFA is interested in following up on this.

As a victim, I am happy to enclose my flight record which was sent to you almost a year ago and I can now add voluminous medical information to it. During the seven years from 1987 through 1993, I always returned with bronchial problems which usually lasted between one and two months, except for 1993. At no time during the time in between trips did I ever develop any similar condition. When I returned in May 1993, I developed the usual problems and still have them. Between May and December of 1993, I received four courses of antibiotics, three x-rays and a pulmonary function test, none of which provided anything but temporary relief. In December, I changed my primary care physician and was given a new routine of medication. This provided substantial improvement, but not a cure. Since then I have been referred to another pulmonary specialist and have had two additional pulmonary function tests. The diagnosis, just in a week ago, says I have developed intrinsic asthma. Intrinsic asthma, unlike other forms of asthma, is not due to any allergies or physical exertion. It is caused by "bad air."

What has this done to my medical expenses? Drugs, which are not covered by my current health care system are now running about $350 per month.

Furthermore, being the eternal optimist, I had planned to take the Bergen lines coastal voyage of Norway in April of this year, but had to cancel due to health reasons. Even though I had taken out trip cancellation insurance, it did me no good because of a pre-existing condition. The jury is still out on whether Northwest Airline will refund the cost of my air fare.

If there is any way I can be of further help, I will be most happy to do so.

Sincerely,

Carmen J. Finley

Carmen J. Finley, Ph.D.
Research Psychologist

Carmen J. Finley, Ph.D., C.G.
4820 Rockridge Lane
Santa Rosa, CA 95404

Certified Psychologist

Overseas flights after which bronchial problems developed, lasting 1 to 2 months (1993 excepted; 1993 problem has lasted to date, now 1 year).

1993	SFO to Detroit	UAL #985 & #446	4/27/93
	Detroit to Paris	NW #50	4/28/93
	Paris to Detroit	NW #51	5/3/93
	Detroit to SFO	UAL #589 & #405	5/3/93
1992	SFO to Bankok	NW #27	2/12/92
	Singapore to Tokyo	NW #12	3/4/92
	Tokyo to SFO	NW #28	3/4/92
1991	SFO to London	BA #286	1/15/91
	London to Madrid	BA #460	1/16/91
	Barcelona to London	BA #447	2/6/91
	London to SFO	BA #287	2/6/91
1990	SFO to JFK	UAL #18	3/15/90
	JFK to Rome	AZ #611	3/16/90
	Rome to JFK	AZ #610	3/29/90
	JFK to SFO	UAL #29	3/29/90
1989	SFO to Tokyo	NW #27	5/7/89
	Tokyo to Shanghai	NW #77	5/8/89
	Hong Kong to LAX	NW #24	5/28/89
1988	SFO to Singapore	SQ #1	1/28/88
	Singapore to Delhi	SQ #48	2/2/88
	Delhi to Singapore	SQ #47	2/20/88
	Singapore to SFO	SQ #21	2/21/88
1987	SFO to London	BA #282	3/31/87
	London to SFO	BA #283	4/23/87

a:\travel.lst

UNIVERSITY OF SOUTH CAROLINA
COLUMBIA, S.C. 29208

CONTINUING EDUCATION
Educational Travel Programs

937 Assembly St.
Carolina Plaza, Suite 606
Columbia, S.C. 29208
Phone: 803/777-9445
May 25, 1994

Congressman James Oberstar, Chairman
Aviation Subcommittee
Committee of Public Works and Transportation
U.S. House of Representatives
2251 Rayburn House Office Building.
Washington, DC 20515

Dear Congressman Oberstar:

I understand that your committee has recently undertaken study of the aviation air quality issue. I have had many past travel experiences - and illnesses - that I have no doubt are a direct result of poor air circulation and quality on air flights.

As director of Educational Travel Programs at the University of South Carolina for the past 11 years, I have come into direct contact with this problem on a continuing basis. We annually conduct approximately 10 tours per year to domestic destinations ranging from New York to Alaska, and also extensive international tours to Australia, Europe, and Asia. We average approximately 900 travelers a year in this program, many of whom are repeaters, and with almost all of whom we still remain in constant contact.

A definite pattern began to emerge in this tour program of severe upper respiratory infections among many of the passengers which most noticeably began on our three-week China tour in 1989. The dry hacking-cough sound that I have learned to know so well had well settled into the group by the time we first arrived in Shanghai. Cough syrups, antihistamines, antibiotics were to no avail. By Xian, I could no longer make announcements to the group, by Bejing I was lying on the back seat of the tour bus in wracking coughing attacks while the group toured the Forbidden City, on the flight home (finally) I thought I was going to just drown from the congestion.

Others in the group were equally stricken. I can still see Mrs. Marion Brock in misery sitting on the wooden bench trying to make it through the Li River trip. When we got home, Eva Holmes (Mrs. Lewis Holmes, Trenton, SC 29847) called to say that her doctor told her that the group had Legionnaire's disease. Maybe not, but it was certainly something with similar symptoms. It took me personally several weeks to get over it.

In the spring of 1993, we took a group of 64 passengers to Australia. The minister, Rev. Thom Jones, who was assisting me with the group came down with the typical mysterious "Aviation Disease" on our first day in Cairns. I could hear the now familiar little hacking cough sounds going throughout the group as we moved throughout the planes.

It actually took six whole days to work its way to me. Having already had another bout with the disease in 1990 in South America (without our group) I now knew what was in store. I broke down and cried when I realized it was hitting me on our last afternoon in Sydney. By that night the coughing attacks were so violent that I called my doctor back home and said, "Fax me a prescription. It's gotten me again."

It took two days to get the Ceclor in Melbourne. Sleep was hopeless. I couldn't lie down, just sit up and tear the lungs out with the endless coughing.

Meanwhile, back at the group. They were calling for doctors at the hotels in Melbourne and Queenstown. One of the medications that was given to Arthur Mowry (903 Whitney Dr., Aiken, SC 29803) had such a strange name that he followed up with his doctor at home and called to tell me about it. Unfortunately, I no longer have that note.

Moving right on along to this year, our most recent African Safari in March 1994 got off to a quick-start. The coughing started from the time we left the Charlotte runway and had settled in full force by the time we arrived in London. We were quick to rush right to the pharmacy on our one day there to load up with the antibiotics. My doctor, Dr. Mary Baker of Charleston, was actually my roommate on this one. (No sleep for her for two weeks listening to me cough away every night.) Dr. Baker had also been with us on the China tour when this disease first manifested itself. She knew the symptoms and what to expect as well as I did. We also knew there wasn't much hope of doing anything about it. Erythromycin had been eliminated in China. Ceclor didn't budge things here - though we began it immediately. By Amsoselli, we switched to high-powered penicillin - still not much better. Just cough, drown, and hope that I could get home alive - again.

Now figuring out just who was going to get hit by this "disease" by now was pretty easy - the same ones who got it when they were with us in Australia, obviously. I could name them before it happened. Mrs. Helen Baynham (1006 Lake Ave., North Augusta, SC 29841) heads that list. She was terribly sick - same symptoms - on both tours. Her note from that trip is attached - as is one from Bub Lewis (Rt.2, Box 405, St. Helena Island, SC 29920) who was actually hospitalized for 10 days after we got home with "pneumonia." Additional sick list from that trip: Aimee Kornegay, Nancy Roberts, Banny Kennedy, Cynthia Corley. Two of these are doctors wives.

What perhaps makes our experience with this tour program unique in relation to your study is that we have a group of passengers with whom we are in constant contact before, during, and after a trip. If we know that this many people got the same type illness, under the same conditions, in a repeating pattern on trips, then I think this bears looking into. Who will ever know how many other passengers walked away from these same flights we were on with ultimately what resulted in the same illness?

I might note that it obvious that everyone in our groups did not get sick - including my husband or my other roommates. It appears as if this "virus" (which is what my medical advisors are now eliminating it down to by its failure to respond to the listed medications) attacks only those who seem to be "Susceptible" to it. (I feel like Superman with a big "S" on my chest. It never passes me by.) Other than when I fly on these long air flights, I never get sick. Never.

I feel very hesitant to come forward with even this much testimony for fear of negative publicity for myself or the University. This hesitancy is overcome, however, by my deep conviction that the allegations concerning the poor air quality and even worse air circulation problems in coach class are all completely true. I submit this letter and my first-hand experiences to you in documentation of it.

Sincerely,

Emily L. Wheeler

Emily L. Wheeler
Director, USC Educational Travel Programs

cc: Ernest F. Hollings
Christopher Witkowski
Geraldine Frankoski

Attachments

Mr. OBERSTAR. The subcommittee will resume its hearing.

We welcome Dr. John Spengler, Harvard University. Mr. Paul Halfpenny, member of the Committee on Space Station Freedom. Dr. James Cone, Department of Medicine, University of California. And Ms. Sue Ludwig, flight attendant.

Welcome to all of you. Thank you for your patience. We begin with Dr. Spengler.

TESTIMONY OF DR. JOHN SPENGLER, DEPARTMENT OF ENVIRONMENTAL HEALTH, HARVARD UNIVERSITY, SCHOOL OF PUBLIC HEALTH, ACCOMPANIED BY DR. HARRIET BURGE, PROFESSOR OF MICROBIOLOGY, HARVARD UNIVERSITY; PAUL HALFPENNY, MEMBER, COMMITTEE ON SPACE STATION FREEDOM, DR. JAMES E. CONE, MEDICAL CONSULTANT, ASSOCIATION OF FLIGHT ATTENDANTS; SUE LUDWIG, FLIGHT ATTENDANT

Dr. SPENGLER. Thank you, Mr. Chairman.

On my right and left are two of my co-committee members from the National Academy of Science Committee on Aircraft Air Quality and Safety, where we delivered our report in 1986.

It is almost like what Yogi Berra said, it is deja vu all over again, because we are finding out that many of the recommendations we struggled with and thought very thoroughly about are still before us. They are still not being implemented. I think we are even in a better position with regard to empirical data to come back to underscore many of those recommendations.

I am Professor of Environmental Health at the Harvard School of Public Health, and I am accompanied by Dr. Harriet Burge, Professor of Microbiology also of Harvard. We continue to have an interest in air quality on airplanes, and even after our efforts on the National Academy committee, we continued to do our own surveys looking at particles, ozone, carbon dioxide, temperature, humidity, and radiation aboard commercial aircraft.

In fact, Sue Ludwig will talk about a year-long study we participated in and our laboratory supported which investigated ozone in aircraft cabins on transpacific flights. This is very important data you should take a look at.

In November of 1993, Dr. Timothy Johnson, the medical reporter for ABC News, asked for our assistance. For that effort we were given independence to design and conduct a survey on commercial aircraft, which we did between March and April of this year. The executive summary has been provided; which gives our findings and recommendations to date.

We are not going to discuss our results in detail as it is already on the docket. But we would like to answer questions that our survey may bring to mind among the Committee Members. In a few minutes I will highlight some of our points of view and recommendations.

Despite the prevailing assumption among the flight crew and passengers that they are at risk from illness, reproductive problems, and from cancer, we still do not have a thorough study of prevalence. The NIOSH birth outcome study of female flight attendants is a very important effort, but it will still be three or four years before the results of that study are in.

Lung function changes are physiological miracles that can be studied at a much greater pace, so the results could be available much sooner. This needs to be done because we don't know the frequencies of illnesses. And case-control studies of cancer among the cabin crew and the pilots are needed desperately.

I just want to point out that radiation has taken on a new significance. There is a recent article published by Wilson, et al. in Health Physics this month about a study which looked at radiation exposures to the pilots and crew of Australian Airlines. They indicated that the exposures have increased over the previous 10 years. Also the exposures are higher in the cockpit than in the cabin of the airplane. By extrapolation, and because of the kinds of routes that American crews fly, the radiation exposures of U.S. crews could be higher than their Australian counterparts. They didn't draw that conclusion from their results, but I do. They also go on to say that the exposures could be five times the recommended level for the general public, which is one milli-sievert (MSV) per year averaged over five years. They strongly recommend that the occupational exposures of 20 milli-sievert (20 MSV) per year are not appropriate for this occupational group. They recommend something like 5 milli-sievert (5 MSV) per year. Even at 5 MSR per year, the risk of cancer is one in 4,000, which is actually higher than what we require for Superfund cleanups.

I want to do this as a duo and have Dr. Burge talk and amplify some of these points. I will come back then with a few simple things that the airlines could do and the manufacturers could do.

Dr. BURGE. Thank you.

I think it is impossible to deny at this point that a problem exists as far as air quality in aircraft, otherwise we wouldn't be sitting here. Many of the complaints that we are hearing or that I have heard today that stimulated our survey are similar to those that occur in office buildings (sick building syndrome and building-related illness). These are conditions that have been shown, at the very least, to reduce worker performance in office buildings.

There is some epidemiologic evidence for correlations between specific measures of air pollutants in office buildings and some of the symptoms we have been hearing about. For example, levels of carbon dioxide in excess of 800 parts per million are, in fact, correlated with symptoms of increasing complaints of sick building syndrome.

There is some evidence for a correlation between the presence of organic dust in office environments and symptoms of sick building syndrome. There certainly is strong evidence, as well as a good theoretical basis for an increase in infectious disease transmission in crowded environments with reduced fresh air ventilation.

The OSHA proposed regulations are specifically designed to address some of these issues. There is clear evidence in airplanes that, for example, carbon dioxide levels are well within the range in which sick building syndrome symptoms occur. In our study, as well as in the ATA studies and the GEOMET studies, carbon dioxide levels were significantly elevated. We are not saying carbon dioxide itself causes complaints, but it is a good indication in office buildings of increasing levels of health complaints.

There is evidence in aircraft for infectious disease transmission and, as I said earlier, there is good theoretical evidence to indicate that increased ventilation will reduce the risk of transmission of infectious disease. For all three of the aircraft cabin air quality studies that we have heard discussed today, the data is really very similar. It is the interpretation (that is, what the data is considered to mean) that differs. There are two main reasons for these differences in interpretation:

Number one: We have heard a great deal today about risks in airplanes being equal to those in other environments. For example, risk of transmission of infectious disease is no different in an airplane than it is in a subway or an office building. But because risks are equal doesn't make them acceptable if the risks can reasonably be minimized.

Number two: The absence of evidence of health effects associated with specific pollutants measured in aircraft doesn't mean that the effect isn't there. It means that the studies have not been done. There is not one single study that measures or in any way documents health effects along with air quality measurements. All the studies we are hearing about only report measurement of specific pollutants. We haven't heard about any study that correlates measurements of specific pollutants with health effects. Until we have this kind of data, we are not going to know whether or not the air quality in airplanes is actually safe.

Thank you.

Dr. SPENGLER. Let me stress five actions that I think the airlines might do and the manufacturers might do. First of all they can emulate Swiss Air and clean their planes more thoroughly. We were amazed to find dust mite antigen and cat antigen in the aircraft carpet, and seat dust samples. It was very easy to collect the dust from carpets and seats.

Mr. OBERSTAR. Expand on that. What does Swiss Air do and how do they do it?

Dr. SPENGLER. I refer to the passion for cleanliness of the Swiss people. The point being that it is a maintenance practice, as well as an attitude that comes down through the management to say, "We are going to improve the conditions of our planes and the thoroughness with which we will clean our planes." That is my point. It may not be exactly what Swiss Air does per se but I will tell you, Swiss Air has very thorough cleaning procedures and requirements.

We found that without a doubt the highest CO_2 concentrations, and possibly the highest potential for exposure, occurred during the boarding and deboarding process. The boarding process alone can go on for a half-hour to an hour. And obviously it is the flight attendants who are in residence the longest under those conditions.

We feel that the airlines ought to reexamine the ozone catalyst issue. And this will be amplified with the results that Sue Ludwig will discuss. There is now good evidence that the halflife of the catalyst used to remove the ozone from the cabin supply air is fatiguing a lot sooner than what you would expect from the design and maintenance.

There is a clear need to understand the internal mixing patterns of cabin air as a means of transmissions of infectious agents. This

is not well understood and I think there is a lot of misconception about how planes internally mix.

Finally, I want to say they ought to examine—this is the manufacturers—I think they ought to examine particle filter efficiencies—what it is in practice, not just from design. Also they could explore the use of UV radiation, which is being used very effectively as a control mechanism for killing TB and viruses in hospitals and other health care settings. This has possible application to aircraft. It may result in an extra safety margin, and should be explored.

That is all I have to say.

Mr. OBERSTAR. Thank you very much.

Mr. Halfpenny.

Mr. HALFPENNY. Thank you, Mr. Chairman.

I am sorry I didn't prepare any written presentation. I didn't understand this. I was confused, easily am.

Mr. OBERSTAR. That is quite all right. We don't need written testimony, except for where there is some very technical documentation accompanying it. I always appreciate a witness who comes to this committee and speaks from the fullness of knowledge.

Mr. HALFPENNY. Thank you. I will do my best.

I thought maybe I would start off by reviewing some of the parameters for fresh air ventilation on an airplane. You described them quite well. Air is extracted from the compressor stages of an engine, although the temperatures usually are lower than 1,200, more like 600 or 700. It is then cooled through a precooler and goes through a heat exchanger and an environmental control unit, where it is again cooled down to the proper temperature, say 30 degrees to 150, whatever is required to heat or cool the airplane.

All of these functions are penalties to the airplane. First of all, extracting from the core engine is a fuel burn penalty. It raises the turbine gas temperature about one degree for every 200 pounds. It doesn't sound like much but they are running up near the limit. It is a drag item.

The air that is used to cool it is fan air, and that is a drag item. And the heat exchangers themselves have a drag item effect on the airplane. The motivation, of course, by the manufacturers is to reduce fuel burn, and this is a very sensitive economic issue with airplane builders. A half percent difference in fuel burn makes them competitive or noncompetitive. When you are burning 12- to 14,000 pounds of fuel an hour, a percent over 3,000 hours per year becomes an immense number.

The other thing about this is that after this air goes into the cabin, it is distributed, and Mr. DeFazio brought up a point or one of the gentlemen did about how effective it was. I believe it was the Chairman who asked a question about how effective it is.

This is something that is probably ignored by most designers. ASHRAE deems effectiveness is 100 percent. You say, Well, I am going to put 100 CFM of air into the unit and there is 1 CFM of contaminant per minute, you will have 1 percent. But that is only if it is well mixed. You can have local concentrations.

I did some analysis of some data and talked to Dr. Burge about it. We tend to agree on this, that the effectiveness in cabins ap-

pears to be weighing under 100 percent. I think this is a thing that the manufacturers are going to have to speak to.

One of the other factors in reducing fuel burn cost is partly due to the development of the more efficient engines. Back in the early days of the 747, the JT9D engine was a four-to-one or five-to-one bypass ratio engine. This means for every pound of air going through the core or hot section, four or five sections goes through the fan flow.

The new GE9 engine is a nine-to-one bypass engine, which means if you take a pound of air out of the core engine, it is taking away its ability to pump nine pounds of fan air. So the motivation to the airlines is much higher to further reduce the flow. And I am sure that they are looking at these numbers.

There are limits on how far you can go. The air in an airplane has to do a number of functions. First, it has to control the temperature, and of course it has to pressurize the airplane.

Most airplanes require from three to five or six cubic feet per minute per seat to maintain full cabin pressure. An extra requirement is to control CO_2. Although there are no standards, usually designed to the OSHA standard of 5,000 parts per minute. And this requires about two to two-and-a-half cubic feet per minute per passenger.

Finally, you must replenish the oxygen that people use. That is, of course, a trivial number. That is like a quarter of a cubic foot per minute per passenger. So there is never a problem with oxygen. CO_2 is the chemical of most concern.

And, of course, CO is limited because of its hazard. But there is normally not much of an exposure to CO on an airplane.

Finally, the air that is, as I say, mixed and distributed, establishes an effectiveness, and that essentially controls the level of comfort in the airplane. If the air is not moving well, if it is stagnant, you feel the temperature much more.

The final aspect of it is relative humidity. The ideal comfort relative humidity is about 40 percent at 75 degrees. That is the near ideal. But on an airplane, that number will seldom get above 20 percent. It is usually less than that, 10 percent, 14 percent. As you increase fresh air flow, relative humidity goes down. In the flight station, relative humidity will be in the neighborhood of 3 to 4 percent.

I believe, Mr. Chairman, you asked a question on the effect of drying out of the mucous membranes. I am not sure there is any data, but I can recall our flight surgeon at Lockheed saying he was horrified to find these low relative humidities and felt it would be a hazard and more likely to pass on germs.

There were a number of other questions that were asked. Mr. DeFazio asked about procedures. I absolutely agree with you. The procedures are pretty well left up to the airplanes. Some airlines turn off all the packs and then term them back on sequentially at 400 feet, 500 feet, number 2 pack at 800 and so forth.

Some airlines turn them off if the ambient temperature is above 85, and the reason is they don't want to flog the engine, because the higher the temperature, the more power it takes to bleed them, so this reduces engine gas temperature, engine life is enhanced.

I believe these kinds of procedures are the kinds of things that could be specified. I don't think that should really be left up to the airlines. I believe there should be some standards.

Dr. Burge, I remember, was very concerned about turning off pacs for 30 minutes. Well, you can sit on the end of a runway with 10 or 15 minutes with all the pacs off on a hot day very easily if there is a pile up at a busy airport like O'Hare or Los Angeles or JFK.

The other question was asked about the life, and Dr. Spengler mentioned the catalyst life. I know the manufacturers do run tests on these. I don't have the latest data. They were lasting about 8,000 hours with some loss of performance.

Filter life usually gets better as the filters get dirty. However, air flow will go down. That could be corrected.

Mr. Laughlin talked about toilet vents. Back in the old days when airplanes were ventilated with pretty much fresh air, the toilets were usually vented through the toilet; in other words, there was a downward flow of waste through the toilet and overboard. With the new airplanes which are conserving air, the air goes through the toilet but it doesn't go overboard. It is dumped into the area near the outflow valve, and of course it has high priority to go out the outflow valve.

However, if your airplane is descending, and that is a good news/bad news sort of thing, during descent there is no penalty for bleed. That is the good news. The bad news is there isn't much air because the engines are throttled back. Under these conditions the flow through the toilet is quite low. And yet you may be putting another 30 or 40 cubic feet per minute into the toilet in the form of ventilating air, but it is not going out through the toilet, it is going out through the door. That is why quite often during descent will you smell the toilet feedback.

This could be fixed by maintaining higher vent flows. Of course, on the ground very few airplanes vent the toilets, because it depends on cabin pressure to do that. The problem of venting that material is a very tough one. It is very corrosive, so we have a problem.

I believe I have covered most of the significant questions I wrote down. But if there are any, I will try and answer them.

Mr. OBERSTAR. Ms. Ludwig.

Ms. LUDWIG. Thank you for the opportunity to address the committee on the subject of airline air quality. My name is Sue Ludwig. I am a flight attendant for a major airline. Like thousands of frequent flyers and flight crew members, I am sick and tired of feeling sick and tired almost every flight.

For years I worked as a domestic flight attendant on older, narrow-bodied aircraft where ventilation was provided by 100 percent fresh air, and I had no respiratory problems. Five years ago, after my airline merged, I began flying primarily long haul international flights and transcontinental flights where up to 50 percent of the aircraft ventilation was provided by recycled air. My health took an immediate turn for the worse. I couldn't breathe and I couldn't think.

My colleagues insisted that feeling sick and tired all the time came with the territory of long haul flying and that it was jet lag

at its worst. But how much can we accept or excuse the term "jet lag"? Circadian rhythm changes cannot account for the apparent high rates of respiratory illness that many long haul flyers experience now.

After studying the subject of airline air quality, surveying hundreds of flight attendants about their health problems, and conducting some research of my own, I am convinced that most of the symptoms we attribute to jet lag are primarily due to poor air quality instead.

Inflight and post-flight symptoms of shortness of breath and tightness of chest, headaches, colds, flu, chronic bronchitis and pneumonia, lung and sinus infections, extreme fatigue, loss of concentration, short-term memory loss, congestion, coughing, runny noses, sore throats, hoarseness, bloody noses, and an array of other respiratory illnesses are rampant among the flight attendant group. That all-encompassing, harmless sounding term "jet lag" should be changed to be called jet sickness, because that is how many frequent flyers feel after they fly these days. They feel sick.

I would like to draw your attention to two specific areas which contribute to the problem of jet sickness. One is the practice of many airlines decreasing the inflight ventilation rates on long haul, wide-bodied international flights to save fuel and money. Another area of concern for airline air quality is the lack of ozone level monitoring for airline cabin air.

On Boeing 747–200 type aircraft, which I work most often to Asia, three independent environmental control units or pacs are used to provide pressurization, ventilation and air conditioning for the aircraft. The same is true for D.C. 10s and L–1011s. Two packs must remain on to pressurize the aircraft, but one pack may be shut off to conserve fuel, a practice that many airlines are exploiting now to save money. Three packs provide maximum ventilation. When a pilot resorts to a two-pack operation instead of three, the ventilation rate is cut down. The negative effects of shutting off one pac in flight are probably not felt in the cockpit, however, because the cockpit is provided with up to 150 cubic feet of fresh air per minute to help cool the avionics.

The ventilation rates in the passenger cabin are much lower. In the first place, there is about 40 cubic feet of fresh air. That drops to 26 with two pacs on. In coach, where there are more people sharing the same amount of air, there are 17 cubic feet of air, which drop to 8 with only two pacs.

They are often not receptive to flight attendants calling up from coach saying the passengers don't feel well. It is not the same ball game for the pilots.

There are also a few pilots who do not take the flight attendant complaints seriously and are reluctant to turn the third pack on after they are requested to do so. They rationalize they are saving the company money and they feel they may be saving their own jobs by conserving fuel at any cost.

These same pilots are quick to point out that the airline, the aircraft manufacturer and the FAA all agree that these low ventilation rates do not harm the passengers or crew. I disagree.

At these lower ventilation rates, carbon dioxide levels are rising rapidly and so are virus and bacterial levels. Contaminant levels

build up as well. Carbon monoxide, traces of insecticide, carpet cleaning solution, and who knows what all else is creating some kind of synergy that we don't even know about yet by reacting with each other.

The virus and bacterial levels are of particular concern to me. Each year a new strain of influenza is bred in Asia, making its way to North America, and many people are at risk. Flights coming from Asia may be a major route of entry for these viruses each year, and they are too small to be filtered out by the aircraft filtration systems.

Moreover, tuberculosis is on the rise in this country and TB bacteria are airborne. With more strains of tuberculosis becoming resistant to treatment, every precaution possible should be taken to protect passengers and crew. This calls for using the highest ventilation rate possible.

It can be argued that no amount of increased ventilation rate could guarantee that a passenger won't contract TB from another contagious passenger. But it could also be argued that increased ventilation rates may decrease the chances of passengers contracting this serious lung disease on board.

Maximum ventilation rates should be used at all times especially on long haul flights where the lengths of exposure to certain illnesses enhances the chances of contracting them.

About ozone. The presence of airborne viruses and bacteria in aircraft makes the levels of ozone found in cabin air an even greater concern. The respiratory system is more susceptible to infection from viruses and bacteria after it has been exposed to ozone. Ozone in air cabin air continues to be a serious threat to the respiratory health of passengers and crew, but its presence and danger have been understated.

At the Harvard University, where I am a student and degree candidate, I conducted my own testing with the help of the Harvard School of Public Health. For a year I monitored the levels of ozone on every flight I worked or rode as a pass rider, including airlines other than my own. I chose to monitor ozone levels because I felt the respiratory symptoms were prevalent amongst the flight attendants flying on long haul flights and were symptoms I experienced myself.

Symptoms of ozone exposure include tightness of chest and shortness of breath, headache, coughing, hoarseness, sore throat and nosebleed. Many of these symptoms may be delayed six hours or more after exposure and may persist for hours or even days after exposure.

Ozone, or O_3, is triatomic oxygen. It is O_2 with an extra atom of oxygen and is present at the higher altitudes. It is harmful to breathe. Ozone enters the plane in the engines. Ideally ozone is stopped before entering the cabin by passing through catalytic converters which convert it back to O_2 or oxygen. And one converter is down line of each pack.

The problem arises when the catalytic converters don't work. They may become coated by flying through a patch of industrial air pollution which renders them ineffective, and currently there is no law which requires the airlines to check to make sure the converters are working properly.

There is no maintenance regime required by the government or the manufacturers either. A new catalytic converter could be placed on an aircraft one day, become poisoned the very next, and perhaps not be replaced for six years, which has been the advertised life-span for some converters.

I spoke with a retired Boeing engineer who invented the first catalytic converters for aircraft and also designed the first converter that aircraft designers used. I asked him, "In the absence of in flight monitoring of ozone levels and required maintenance schedules, how would one know if the converters were working or not?"

He informed me that the first indication that a catalytic converter was not removing ozone efficiently from cabin air would be a sick flight attendant.

Working flight attendants breathe more ozone than the pilot sitting down. This is 1994, and as—I will use this analogy for the third time this afternoon—a flight attendant should not be the canary in the mine for harmful ozone levels in airlines.

In the past the effects of ozone were thought to be transient. Researchers know better now. The effects are serious and may be long term. They include pulmonary edema, chronic bronchitis, premature aging of the lungs, permanent cellular damage to the lungs, diminished lung capacity, and as previously mentioned, greater susceptibility to viral infection which may lead to lung disease. These effects have caused one researcher to view chronic ozone exposure as the potential source of a new industrial disease.

And the health effects of ozone are also cumulative. This has prompted prominent researchers to recommend that ozone limitations for researchers be measured for annual exposure levels as well as hourly exposure levels.

For example, a flight attendant who has been exposed to high ozone levels which exceed the FAA limitation of 0.1 ppm may suffer acute symptoms of ozone exposure. But another flight attendant, however, who has chronic exposure to high levels of ozone that do not exceed the FAA limitation may still suffer long-term and permanent damage because of the cumulative effects of long-term exposure.

Continuous in-flight monitoring of low-ozone levels is needed to detect catalytic converters that are not working properly and to assist in calculating the annual cumulative levels of ozone that flight crews are exposed to.

In 1986, the National Academy of Sciences recommended to the FAA that they monitor levels in airline cabins for the many reasons listed above. The FAA has failed to act in this area of air quality.

The preliminary results of my research project, which monitored in flight ozone levels for a year, shows that the flight attendant limitation of point one parts per million with a time weighted average of three hours was exceeded in at least 17 percent or 20 flights of the 118 flights I monitored that were over three hours and above 17,000 feet. Moreover, the levels were exceeded during the entire length of many transcontinental flights.

In conjunction with the flights I monitored, I took testimony from flight attendants. These compelling testimonies in the crew mem-

bers' own handwriting was further evidence that respiratory distress was a factor for many crew members on the flights I monitored.

Government agencies often complain they do not have enough evidence in the form of first-hand testimonies or hard data to decide if a problem exists. My research project provides evidence from the very group that has been subjected to this unreasonable and even debilitating air quality for years now.

I urge the committee to take steps now to ensure that maximum ventilation is provided on all flights for the health and safety of passengers and crew, and to eliminate the serious problem of ozone in airline cabin air. The fact that it may take an act of Congress to have enough air, enough ozone free air to breathe on airlines, should be an embarrassment to the industries responsible and to the FAA for allowing this situation to progress so far for so long.

If this committee resolves to take action now, we can finally make a few steps in the direction of finding a cure for jet sickness.

Thank you again for the opportunity to share my findings with the committee. I would also like to thank my fellow flight attendants as well as the scientists, researchers, doctors, professors and concerned citizens who are hard at work on this urgent issue of airline air quality.

Mr. OBERSTAR. Thank you very much. I appreciate very much your perspective on ozone and the insights you have provided us here today. It is very useful.

Dr. Cone.

Dr. CONE. Mr. Chairman, Members of the subcommittee, I really do appreciate the opportunity to address this committee regarding the issue of cabin air quality.

I have been concerned about this issue since I was a medical student at University of California, San Francisco, and a public health student at UC-Berkeley. That year, 1978, I was speaking with flight attendants, actually I believe there was a flight attendant in one of my classes who raised the issue of ozone. That was the year a Wall Street Journal article came out raising this issue as well.

That resulted in a health study, which was published in 1980 regarding the health effects of ozone on flight attendants. I think this is an important example of how the flight attendants individually and through their unions have taken the lead in trying to bring the attention of not just their own industry but of the public to the problems being faced every day as they fly and serve the public in their health preserving capacity.

I think that is an important statement by itself, that we have a number of agencies in the government which are responsible for public health, but in this particular example we have the flight attendants essentially taking this issue and keeping it before the scientists in this community, keeping our attention focused. That is borne forth by the testimony as well.

I am concerned about the current situation regarding airline cabin air quality for two main reasons. One, I have in the past 10 years been practicing occupational medicine and internal medicine at the University of California in San Francisco. I was consulted repeatedly by flight attendants who had stories and histories similar to those you heard today. It was a very disturbing series of pa-

tients that continued to bring me back to the issue that, we really don't know what is the cause of these problems, particularly the more dramatic exposure incidents, which you have heard a little bit about today.

We have some clues based on the studies that have been done. The studies, particularly the GEOMET study, the ATA study, and most recently the Harvard study, looked at exposure as an issue, but I think we haven't made the link yet to how that exposure is related to health effects. I think that is where Dr. Burge's point, Dr. Spengler's point is right on target.

We still need a definitive study. There is no comprehensive study of health effects associated with this industry.

I am also concerned about the current lack of standards which has been discussed and addressed repeatedly. I won't go into those anymore, but I think the issue of OSHA regulations has been raised. Here we are talking about a different situation. OSHA has set the standards for worker exposure to many different substances. Aboard aircraft, however, we have exposure to infants, the elderly, sometimes people with asthma, who may not be able to tolerate the environment that a healthy worker may be expected to tolerate.

The OSHA standards would help. They are generally better than the FAA standards, but unfortunately they are not designed to protect the traveling public. That is why additional efforts need to be made to protect the public health as well as developing standards to protect the workers in this environment.

I, probably like you, applauded the efforts in banning the smoke on aircraft less on than six-hour flights. I was on a flight last night from San Francisco, and somebody was smoking in the lavatory. There still needs to be some work. We still have people smoking on non-smoking flights.

Dr. Jordan, in an earlier testimony this afternoon, said there were no differences noted in contaminants between the airplanes with fresh air, 100 percent fresh air, and those with recirculated air. I just don't read the same literature the same way. I just don't understand that statement, because in every study I have looked at, there are differences, and the differences in levels of particulates and microbes, namely bacteria and fungi. There are differences in every substance measured—the only exception I think is the organic hydrocarbon compounds in the ATA study were somewhat higher in the 727 flights.

I bring to your attention that something is going on, in particular, recirculated air is not as clean as the fresh air that we have been used to in the past.

I think point sources are important in an aircraft. Ventilation alone will not necessarily protect us. I think that is a lesson that we have learned over and over again. I have worked with Dr. Burge on the Environmental Health Committee of ASHRAE, the American Society for Heating, Refrigeration and Air Conditioning Engineers, and we have struggled with this issue over and over again. I think we have come to the conclusion that ventilation is important, but controlling point sources are even more important.

If we can identify point sources for some of the things that were found, for example, in the Harvard study, we need to address them,

because it is so much more efficient to reduce exposure by reducing those point sources, whether they be a person applying finger nail polish, the carpeting, the frequency of cleaning of the materials that are basically taking in all these volatile materials, storing them and then releasing them when the temperature changes.

So I think we need to look for point sources. We need to try and find out why there are endotoxins on the aircraft. I think that was a very important finding that hasn't really been emphasized today. The endotoxins are products of bacteria including the cell walls, the proteins essentially that have been produced by the bacteria. We found in the literature now there are examples in buildings where endotoxin levels being measured in the air correlated very well with the so-called sick building syndrome symptoms. These are nonspecific symptoms of the eye, nose, throat, headache, and so forth.

I think this is a very important clue. I think this Harvard study has really opened that question up. Where are the endotoxins coming from if there are so few bacteria on board? And what are the health effects of this particular type of material?

I would like to conclude by discussing my patients who have asthma. I have patients who are very reactive to environmental stimuli and they are people with allergies, people with asthma, people with various types of sensitivities to the types of things we have heard today from the flight attendants. I think the problem we are seeing is that this group of people are being faced with a choice. Either they don't fly, and many of my patients have just stopped flying, or they suffer the consequences of flying, which means being fairly ill during the flight and then paying a high price after the flight with persistant symptoms which may take days or weeks to recover from.

I think there is an issue here of accessibility. I think that the Americans with Disabilities Act is supposed to address issues of transportation accessibility and reasonable accommodation. I think we need to address, whether the current situation on board aircraft is such that it really does not allow access to these citizens who otherwise would have the freedom to travel and are being somewhat restricted, in effect, by the air quality issues?

I would like to propose a number of things. I think the first thing is one that is on your agenda, that is, I think Congress should set a standard for minimum acceptable ventilation. It should be a health standard. It should be a public health standard which protects those most vulnerable people in our population. This would be the infants, the elderly, and those with reduced ability to tolerate poor air quality.

At the same time, if we do set a standard, this will help protect the people who are going to be protecting us in the air, namely flight attendants. I think it is an important step.

It is really unfortunate that the Congress has to do this. It could have been the FAA. They could have done this in the past.

I think we need a reporting system so that people with problems do get heard. Right now, apparently, the reporting system is not effectively capturing those complaints.

We need more research. I think we know enough to do a couple of things you have already outlined, banning of smoking on inter-

national flights, banning pesticide use aboard aircraft. I think we also know enough that there are certain ventilation standards that should be set. I think there is an issue of what are the health effects. I think we need to answer those questions better than we have.

We also need to consider whether we need to have surveillance for tuberculosis among airline flight attendants. That is an issue I think we need to at least ask. Is this something—because every time we hear a case report from CDC, they say, We don't know what the people's previous TB skin test reactivity status may have been, because nobody is doing the surveillance. That is true in many areas in our society. We really don't know what the baseline rate of tuberculosis infection is, because of the lack of TB surveillance programs over the last 10 to 15 years.

So that raises the issue, what is the baseline level of tuberculosis among the flight attendant population today? With that information, we can assess some of these incidents where we have an infected passenger or flight attendant on board. It would make the CDC's job quite a bit easier.

Finally, we need to bring information into the hands of the flying public. I think that will be the deciding factor in this case as it is in many others. If passengers were given information about the level of ventilation on the aircraft, as they can choose which seat they get and what kind of meal, they could make some economically wise decisions. If you are told for an additional 60 cents you can get fresh air that wasn't breathed by five or six people before it gets to you, I think people may choose to spend an additional 60 cents. I think that is the economic argument that might motivate the airline carriers to advertise. It could be a marketing tool.

I think passengers and flight attendants should be informed about pesticide use before they buy the ticket. At least then people could make a choice, Do I want to be sprayed by this pesticide or not?

Mr. Chairman, I do thank you for the opportunity to speak before the subcommittee. I am available to answer any questions.

Mr. OBERSTAR. Thank you very much.

That is very substantive testimony each of you have presented. I greatly appreciate your attendance here today.

Mr. DeFazio.

Mr. DEFAZIO. I thank the Chairman.

I guess first to Mr. Halfpenny, you seem to have a great background and grounding. Did you hear the earlier testimony? I certainly intend to ask the Boeing engineers when they are up later, but I never know what will happen to our schedule, if I will be here for them, so I thought I would ask you about the allegation from the earlier testimony that the earlier 747s are on or off, there is no ability to change the amount of circumstances or compression with the packs, the packs are either on or off is what they alleged.

Mr. HALFPENNY. The 747–400 is a four pack plane and it has a number of stations each with their individual fan, so a crew could select one pack off or possibly two, although that would be unlikely.

One of the questions I believe you asked, Mr. DeFazio, was about the restrictions, and the FAA man didn't answer that very well. The FAA has very strict restrictions on a single pack flight. If you

are down to where you would lose pressure, you must descend 25,000 feet. When they talk about two pack airplanes turning them on or off, I don't believe a reasonably intelligent crew member could do that. He would expose himself to dropping the oxygen mask with a single failure, and there is $60,000 right there.

I think those are anecdotal stories. To answer your question, no. They would be turned off in units of one, one, two, or three packs on.

Mr. DEFAZIO. So it isn't all on or all off as that person alleged?

Mr. HALFPENNY. Yes.

Mr. DEFAZIO. I know this is not the topic of my hearing, but this came up six years ago about the oxygen mask. Essentially when the oxygen mask desends, we are dealing with a very limited supply of on board oxygen. In fact, you reach a certain altitude, you begin to breathe cabin air again through the oxygen mask.

Mr. HALFPENNY. Most of the airplanes today use what is called chemical oxygen. It is potassium color eight, which generates more oxygen than it burns. It actually burns and produces oxygen. It has a life of about 20 minutes, so after 20 minutes, if you are not down, yes, you will be breathing air.

Mr. DEFAZIO. So in the case of an on board fire, if you don't get off the plane within 20 minutes——

Mr. HALFPENNY. Probably the oxygen would not be a good idea either in an on board fire.

Mr. DEFAZIO. Well, a smoke fire, toxic smoke. I was just wondering—Ms. Ludwig, on your research, you mentioned research early on and then you talked about the ozone. You restricted yourself to the ozone research.

Ms. LUDWIG. Yes, I have just begun to look at the issue of radiation. I am a novice in that area right now. But my research study was measuring ozone levels exclusively. But during the course of doing that research and taking all these flight attendant testimonials, it came to my attention there is a certain profile of illness among flight attendants, and one that got my attention were symptoms I think NIOSH is going to be addressing here in their field study in two years.

I think there is a tremendous miscarriage rate for fertility, problems with menstrual cycles, early menopause, female cancers. It really is staggering when you see people write this down, how many miscarriages they have had, multiple miscarriages.

So my next area of study will be radiation, but the study that I did regarding airline air quality was focused on ozone.

Mr. DEFAZIO. And you found a 17 percent rate of violation of the set standard?

Ms. LUDWIG. Correct.

Mr. DEFAZIO. That was on how many flights?

Ms. LUDWIG. One hundred and eighteen over three hours, because the FAA regularly provides for 0.1 over 27,000 feet for a time weighted average of three hours.

Mr. DEFAZIO. Don't we find this puzzling, because I think the FAA alleged that—I guess they didn't find any violations.

Ms. LUDWIG. I think in the 1986 study, they also quote a 1985 study, that that showed at least an 11 percent violation, too. You

also have this problem when you have health and labor against industry and bureaucracy, I suppose.

A couple of points I always try and weigh when you have experts lined on both sides of the table with opposite testimonies is first to consider the source, the source of the testimony, what kind of bias might there be.

Second, the coherence of the evidence is if both people or sides are making valid arguments, which evidence is the most compelling, which evidence is the most believable.

And then finally, I suppose when you have two sets of experts saying different things, you have to use your own judgment.

Mr. DEFAZIO. Dr. Spengler, you were here for the earlier testimony of AODET—and I guess I am having, as Ms. Ludwig says, a little cognitive dissonance here. As I recall, there is not a serious air quality problem. I asked if there was none whatsoever. The gentleman did allow as to how he wouldn't make that statement. But their current rather vague standard was adequate.

You seem to kind of refute that with your study. Are we dealing with a reputable guy here?

Why is it that I hear from my government experts that they reviewed the ATA study, which of course is not biased, then the earlier study which we had to twist their arm for four years to get them to do under the Reagan and Bush years, that wasn't biased either, but yours is. Could you address that a little bit?

Dr. SPENGLER. I guess the short answer is beauty is in the eye of the beholder, and it is where you look and how much you want to look at and how you interpret that data.

And I think each of these studies is a snapshot. It is a piece of a very complex puzzle. Unless you look on spring time, winter time, high latitude and transoceanic flight, you probably won't see much ozone. In those kinds of flights you are getting into the stratospheric ozone that intrudes into the lower atmosphere.

I was quite surprised to see how prevalent it was on the series of flights that Sue Ludwig investigated.

Mr. DEFAZIO. So you have evaluated her data-gathering and her, you know, basically her method and find it to be valid?

Dr. SPENGLER. Yes. And we have actually performed some of these ourselves as part of the survey that she is doing on flights to Asia, and it is our laboratories that analyze all of the ozone monitors. So we stand behind that database.

And I think it is important to put it in perspective. It is equivalent for the passengers and flight attendants, for the duration of their flights, to being in Mexico City polluted air, which is two to three times the Los Angeles air pollution.

These are high ozone levels. That it is occurring on a segment of the flight that may be minutes to a few hours makes the levels very high in my mind.

And you know, I don't want to be an alarmist at this point, because this was a series of flights that were of extended durations, high latitudes, and by one carrier. We want to look further in this regard, but it really brings us back to the point that if we are being told that ozone should not be penetrating into the cabin of the airplane yet we are finding it in such high concentrations, that suggests that some control system is failing.

Mr. DEFAZIO. Was—I believe it was Ms. Ludwig's contention—and again, I will be asking some of the engineers representing the manufacturers—that a catalytic converter could become virtually disabled through one incident. Is that possible?

Mr. HALFPENNY. Well, when we put the first catalytic converters on the A–1011, the FAA required that you simulate it, a complete engine oil failure, which we did. And the catalyst then was just drenched with type 2 oil, which is a synthetic oil. Then you were allowed to run hot air through it at about 400 degrees for a number of hours, and they had to recover, and they did; they recovered to maybe 75 or 80 percent efficiency.

The manufacture of these catalysts is very tricky. They are platinum, palladium or radium materials and they are very expensive and the techniques are highly proprietary, and various manufacturers have made better catalysts off and on. So a single event, I don't think would completely poison it. I think the catalyst would regenerate up to some percentage; in our case, it was almost 80 percent.

Mr. DEFAZIO. Okay. Ms. Ludwig, do you want to address that?

Ms. LUDWIG. Yes. Well, the source of my information about whether or not a catalytic converter can be poisoned is from the gentleman that invented them to begin with, and from the gentleman who has, I think, a primary contract with Boeing at this point for the second-generation catalytic converters, which airline manufacturers can clean now. Before, they had to send them back to the manufacturers to be treated, and that was a disincentive because it involved cost and time.

And according to the gentleman who made them to begin with, and makes them now, this is a problem. That is why he is in favor of ozone monitoring.

In any event, my ozone measurement shows there is a problem. I have a problem when I am on an aircraft with high ozone concentrations. I have shortness of breath. I can barely get out of bed to go to class. That is anecdotal, but I have hundreds and hundreds of other testimonials to verify that, too.

So the source of my information is from the Boeing engineer that first created them and still makes them.

So I am not disputing what Mr. Halfpenny says, but I wanted to also tell you where I got my information.

Mr. DEFAZIO. Sure. No, that is fine.

I guess just to, you know—my vision is getting bad. Dr. Cone, I believe, right? The issues you raise I thought from sort of a public health perspective were pretty interesting, the idea of the public health standards. So I guess you would probably then—I think you did say—share my view that we should look for a set standard or regulation from the FAA, rather than—I mean, can you think of any reason why, from a public health perspective, they haven't promulgated one; or are we just dealing with economics here?

I mean, is there any reason why we would just want to say to the airlines, you know, you have to provide an adequate flow of air? I mean, can we think of any benefit—I mean from a public health perspective—why we would want to do that?

Dr. CONE. I can only comment from my experience dealing with building-related problems, and it is the same experience that there

has first been anecdotal evidence, than more findings with some bigger studies, and then finally the public health perspective was brought to the fore as the public became interested, so that the evidence finally overcame the inertia, I think; and that is happening in the new OSHA proposed indoor air quality standard.

We finally have a proposed standard that is based on "public health" instead of "adequate protection." I think it is the same process.

Unfortunately, the aircraft turns out to be a more sensitive or more precarious environment, so you see even more extreme examples, perhaps.

Mr. DEFAZIO. Yes. The incredible amount of research that has had to go into some of these so-called "sick buildings," some of which I think we haven't even figured out why there are problems, and their fix source was relatively few operating parameters as opposed to a plane—you know, different altitudes, different operators in terms of pilots, different operating conditions. I mean, it just seems to me that to dismiss all of the anecdotal evidence, which there seems to be some significant body thereof, would be folly.

Would you think, perhaps, that given the degree of anecdotal evidence, we should be doing some epidemiological studies among the most likely affected people, for instance flight attendants?

Dr. CONE. I would certainly concur with that, and I hope that NIOSH and the CDC will engage in these types of studies in the future.

Mr. OBERSTAR. The gentleman's time has expired.

Mr. DEFAZIO. I thank the Chairman.

Mr. OBERSTAR. Mr. Clinger.

Mr. CLINGER. Thank you, Mr. Chairman. I want to thank the panel for very helpful and substantive and thoughtful testimony this afternoon. One of the obvious problems that you have here is, as you have indicated, Dr. Spengler, that there really isn't, at this point, the data. We need to evaluate how serious the problem is and what really needs to be done about it.

Is there a way to do this that would show us the connection between the disease and where it was transmitted from?

Would it be helpful to have a hotline, for example, to report illnesses and be able to trace them back to the exposure on an airplane? It seems to me that it is very difficult to make the connection between the disease that we are looking at and where it came from.

Dr. SPENGLER. I think you are exactly right. I mean, the complexity here has to do with the exposure profiles of your subjects that you want to have observations on, as well as the multiple causative factors that could give the same outcome.

You know, respiratory infections have multiple causes—multiple places where we get exposed. And that is why I am not really enthusiastic about the hotline, only because it will just be another self-evaluation; we will not get at the denominator. We will get the numerator, but not the denominator, and probably don't even have a good estimate of the numerator—in other words, how many people really does this represent?

But it might give us insight, as to whether there are specific clusters of outcomes of complaints that say, "gee, maybe if we look

at eye irritation and take a novel approach at this and look at tear film, leukocytes saying, yes, there is inflammation, that is a precursor to irritation and to sensory irritation that is occurring in these kinds of environments."

This can be objectively measured, and is already being applied in sick building investigations in Europe. It has not been done in the U.S.

There are investigations that could be done in chambers where we take certain compounds and expose the sensitive individuals, volunteers, to take part in those studies—asthmatics, in particular—to say, "do we see effects of the combination of endotoxins, bioagents, ozone and low relative humidities?"

In this manner we can test it out of the system and get at a good understanding of what the mechanisms might be and see if there is a biological plausibility, as we are indicating in our survey, that there is the plausibility. But let's see if it really manifests itself in a sensitive population, or in the general population.

Beyond that, I am convinced we could perform an epidemiologic study on the flight attendants and on pilots in a very systematic way, where we would really start to track some of the parameters that they are exposed to.

Mr. CLINGER. And that has not been done to date?

Dr. SPENGLER. No, it has not.

Mr. CLINGER. Or is not contemplated to date? As far as you know, it is not being considered?

Dr. SPENGLER. It is not being pursued.

I would recommend it being pursued through our National Institutes of Health.

Mr. CLINGER. Right.

Dr. SPENGLER. Not FAA. I would concede that NIOSH certainly has the capabilities of doing it, but if we are talking about the general public, I think this is a good study to have done in the National Institutes of Health which has the strength of a peer review competitive process.

Mr. CLINGER. Dr. Cone, do you want to add to that?

Dr. CONE. I think we have a situation involving "sentinel health events," things that essentially should be warning signs—the tuberculosis in a flight attendant. These things now are coming to us pretty much by chance. There is no system now gathering these "sentinel health events," and I think we need at least that. I think it is a first step toward really focusing in on what are the health effects we ought to look for.

I agree with Dr. Spengler. We need to look at sensitive indicators. In the future, hopefully, we can develop hypotheses, based on our surveillance system, then test them both epidemiologically and in the laboratory, and then go back again to the airlines and say, we have a problem we need to address with this particular type of solution.

That is a system that will hopefully then send us into a different spiral, hopefully, toward better health rather than this continual downhill spiral I think we are into right now, the way aircraft are being designed.

Mr. CLINGER. Doctor, just following up, you are recommending that the flying public should be notified as to the degree of ventila-

tion on board an aircraft. But we have already heard about some of the problems in sick building studies with rooms, hospitals, libraries, schools, whatever. Should we provide the same kind of information in those venues as we do on an airplane, or is there a difference because you are a captive audience on an airplane?

Dr. CONE. The issue of notification, is one of basic human rights. I think that people need to be notified that there is something that is potentially going to adversely affect your health. I think the same principle perhaps could be applied to buildings. But I think the difference is essentially that if you feel uncomfortable in a building, you can leave. But in an airplane, my patients are trapped and they need to know ahead of time, should I pick a different carrier, a different aircraft, perhaps try a different mode of transportation?

Mr. CLINGER. Dr. Spengler, based on what we know today, I take it the recommendations that you would make at this point would be limited to better ventilation for aircraft and better cleaning?

Dr. SPENGLER. Well, I am going to find myself at odds with some panel members here. The ventilation standard of 10 cubic feet per minute per person has served us well for years and dates back to experiments done by Yager tubes in chambers of people back in the 1940s, and that was incorporated in our standards.

The reason why it (20 CFM) doesn't seem to be doing it nowadays and why ASHRAE recommends we go to 20 cubic feet per minute per person in office buildings and in schools is because we have a proliferation of sources that didn't exist previously. Just look at your own office setting. You can see all the modernization that goes on; the proliferation of chemicals that are used in our modern society.

And we may even be seeing a degree of increase in sensitivity among our population to these chemicals. One of the hypotheses that is offered to explain the Gulf War veterans and their symptoms, is their hypersensitivity to chemicals.

I am not saying that is absolutely the cause. But it is part of what is hypothesized. And it is truly unknown; it has not been studied thoroughly.

We also may be seeing, as our population ages, the expression of immunological and neurological effects that we had not understood before. It wouldn't be surprising that it might manifest itself in these special population settings like airplanes, like office buildings, like homes. So it doesn't surprise me that this might happen.

Mr. CLINGER. Does anybody else want to comment on that?

Mr. HALFPENNY. If I might make one comment. Dr. Spengler talked about the old standard. The aircraft standard 20 years ago was 20 CFMs, but that is what it would be if we had smokers on board. Without smoking, it was generally felt that 10 CFM would be adequate to control odors and control CO_2.

Mr. CLINGER. Ms. Ludwig, the study that you undertook, was that data you collected yourself or did you get data from other flight attendants on other flights? Or were you taking tests on only those flights that you participated in?

Ms. LUDWIG. Yes, the flights that I flew for a year as a working flight attendant or as a pass rider. The study was done in conjunction with the School of Public Health; the testimonials, however,

were from my fellow flight crew members on those particular flights.

Mr. CLINGER. On those particular flights?

Ms. LUDWIG. On those particular flights that I monitored. After that, when I saw so many health problems, I took to taking testimonials wherever I went, to try and develop a profile; and then I decided to try and do a survey myself maybe this summer, more in depth, of what I have learned from this.

But, yes, on it was on my flights, on my particular flights.

Mr. CLINGER. In comparison with the ATA study, how many flight segments did you collect data on? Are the studies comparable in terms of the number of segments?

Ms. LUDWIG. I don't remember how many segments they have—35. Yes, my sample size was bigger and therefore my margin of error would be smaller. I would assume that mine would be more reliable in terms of margin of error.

Mr. CLINGER. Did you attempt to make a correlation between the levels that you found, that you were testing for, and any illnesses that arose, to find a direct connection between the atmosphere in the cabin of a particular airplane and the illness that might befall a flight attendant on those flights?

Ms. LUDWIG. Yes. Most of the flights, and that is where the levels were exceeded, were sick with respiratory distress.

Mr. CLINGER. So if it happened on just one segment of one flight, it could cause that illness?

Ms. LUDWIG. Do I think just ozone caused that illness? No. I think there are layers and layers and layers of things that are the problem here, from radiation, which I cannot stress enough, to ozone to ventilation rates to chemicals in the air—pressure altitudes. This is a mystery to a lot of people. We have to begin someplace with things that we know are hazardous and harmful. We have to start. Everybody is just walking around scratching their heads. Some people are claiming there is no problem. I think we all know better, that we should start somewhere and start at least with the things we know are harmful and then proceed from there.

Mr. CLINGER. I guess what I was saying, and what you are finding here, is a cumulative effect. The illness doesn't result from one flight or one exposure.

Ms. LUDWIG. The long-term effects can be cumulative; but yes, the short-term effects can result from one flight. You can have shortness of breath and those feeling respiratory distress from one flight where there is an excess of ozone. But people have different sensitivities.

Sometimes—quite often people become immune in this respect and they don't demonstrate symptoms of ozone any longer, but yet the damage to the lungs continues. Other people become hypersensitive. I think that applies in my case. If I stand in a Xerox copy shop, for example, where ozone levels are also high, I can't be there more than 10 or 15 minutes without a nosebleed now, and tightness of chest as well. But even in people who have been exposed to ozone, who aren't demonstrating the symptoms, the short-term symptoms, it doesn't mean that the cellular damage or the lung damage isn't happening.

But for long-term, permanent damage, the cumulative effects may in fact be more important than just looking at the levels that pass the current 0.1 FAA limitation. Most researchers call for lower limitations than that anyway, because of the sensitivity factor.

Mr. CLINGER. Thank you.

Mr. OBERSTAR. What is the difference between the quality and effect on passengers, flight attendants, cabin crew—I mean cockpit crew—of outside air versus recirculated air?

Mr. HALFPENNY. Well, outside air, of course, at altitude, is essentially perfectly clean. It is—it has almost——

Mr. OBERSTAR. It is very dry.

Mr. HALFPENNY. It has essentially no moisture and it also has no particulates and just nitrogen oxygen, nitrogen and a few trace gasses. Recirculated air in most airplanes is treated usually only to remove particulates with the high-efficiency particulate filters.

Mr. OBERSTAR. Is that the principal purpose of the filters, to remove particulates, not to remove any disease-bearing organisms?

Mr. HALFPENNY. Well, they will actually remove bacteria, or they are supposed to, bacteria down within the range that they could handle. Bacteria run—oh, I forget, let's see—bacteria are running about in the range from 0.3 up to 10 microns. And these are very efficient down to about 0.3.

Viruses, no. Viruses are well below that. They are down into the 100-micron range, although I understand they tend to accumulate and you can sometimes take them out.

But basically they should remove smoke, tobacco smoke, if there were any, and most bacteria and particulates, airborne particulates.

Mr. OBERSTAR. What is the source or what are the sources of ozone aboard aircraft?

Ms. LUDWIG. It is created in the upper atmosphere with the help of the sun's energy. So the sources, the ozone is outside the aircraft in the upper atmosphere and the airplane flies through the upper atmosphere and takes in this air for ventilation which happens to contain ozone.

On the ground, ozone is a by-product of exhaust combined with sunshine. That is part of the element of smog, which is so detrimental to our respiratory system.

But in the upper atmosphere, ozone is created with the help of the sun and it comes in through the engines.

Mr. OBERSTAR. So do we conclude then that, at altitude, when more outside air is taken into the aircraft, you are taking in more ozone and creating more of a problem?

Ms. LUDWIG. If there were no catalytic converters on board or if they were not working. It is the only thing I could think of where you actually may have more of it when you are getting more fresh air. But, ideally, again, catalytic converters should be able to take care of this problem, if they are maintained at all and if there is a directive by the FAA or some other governing body that they should be checked to see if they are working.

Mr. OBERSTAR. Is there a standard for catalytic converters set by the FAA, or is this another one of those manufacturer standards?

Mr. HALFPENNY. I might answer that. The FAA sets a standard which says that the time-related average shall not exceed 0.1 parts

per million. The maximum is 0.25 parts per million. You can calculate this a number of ways. You can take the efficiency of the converter and then you apply what is called a cabin factor or recovery factor.

If the catalytic converter were removing 80 percent of the ambient ozone, you could say that the cabin system itself will remove another 10 percent, because ozone is an active material and it eventually will decay back to oxygen.

So most manufacturers rely upon this cabin recovery factor or R factor.

Mr. OBERSTAR. Is there a manufacturer requirement for the air carrier to test the efficiency of the catalytic converters or is it an FAA standard?

Mr. HALFPENNY. Yes, to test both the cabin and the efficiency. They run tests on the cabin to see what the breakdown of ozone is in the cabin itself.

Mr. OBERSTAR. How frequently is that done?

Mr. HALFPENNY. Usually when you certify the airplane.

Mr. OBERSTAR. Just when it is certified?

Mr. HALFPENNY. Yes.

Mr. OBERSTAR. After it is in the operation, there is no further testing?

Mr. HALFPENNY. Not to my knowledge. I think it is a certification-only problem.

Ms. LUDWIG. And the aircraft has a long life and the converters do not, and so we have a problem here. We should have——

Mr. OBERSTAR. To your knowledge, what is the life span of a catalytic converter on board an aircraft?

Ms. LUDWIG. Well, they claim up to six years. I think they replace them probably sooner than that, because they get so many complaints. When I say "they," I am only familiar with a couple of airlines and their policy towards this. But——

Mr. OBERSTAR. What do those cost?

Ms. LUDWIG. The most recent cost figures I have is $5,000 apiece for the kind that you can clean yourself as an airline, but you would need on a wide-bodied aircraft, at that rate, three—one for each pack; it would be $15,000.

Mr. OBERSTAR. Three per aircraft or three per pack?

Ms. LUDWIG. Well, it is the same thing. If you have three packs, you need three converters.

Mr. OBERSTAR. Okay. I see.

Ms. LUDWIG. Right.

Mr. OBERSTAR. One per pack.

Ms. LUDWIG. Correct.

I really strongly feel that we should have continuous on-board monitoring of ozone levels, as well as other contaminant levels, to find out if a particular crew or a particular aircraft seems to be a problem. It would be better to pinpoint it through on-board air quality monitoring.

Mr. OBERSTAR. Which makes the greatest difference of cabin environment, or for the cabin environment, increased fresh air or increased air flow of whatever mix is in that particular aircraft?

Mr. HALFPENNY. Actually, they both work together. Increased fresh air will cause rapid dilution of all of the contaminants. Be-

cause the air is clean, it has no bacteria, it will reduce bacteria count; it will also reduce CO_2 or any other contaminant. It will also reduce moisture.

Now, total mixing of the air is an important factor, and people talked about shutting off a pack. Mr. DeFazio talked about it. When you do this, you do two things.

First of all, if it is a three-pack airplane, you reduce the air flow by approximately one-third. But you also reduce the effective mixing in the cabin, because the velocity of the air coming out of the ducts is also reduced by one-third. And that causes poorer mixing itself in the cabin and that reduces the effectiveness of that air in removing air. It is as if you brought air into this room, air-conditioned air, up near the floor and then exhausted it near the floor; it wouldn't do much good. That is called short-circuiting, so you try to avoid that.

So reducing total flow is always bad and reducing fresh air flow is always bad. In what proportion, it is hard to say.

Mr. OBERSTAR. Is there an increased cost—to your knowledge, would there be an increased cost to airlines of increasing the mix of outside air to recirculated air on, say, newer version aircraft—Airbus, 757, 767, 777?

Mr. HALFPENNY. Yes. If you are talking about the design or the operating cost, there is definitely a cost increase. It is mostly due to the factors I mentioned, leaving the engine in drag. I did a calculation that said that if you had 20 CFM per person and it was 100 percent fresh air, you would burn about 350 pounds of fuel per hour per airplane. This happened to be for a 727 and a 1,500-nautical-mile range.

If you reduced the fresh air to 10 CFM per person, the net air flow would be in the range of about 200 pounds per hour. So you would save 180 pounds of fuel per hour by reducing from 20 CFM to 10 CFM.

If you are talking about retrofitting airplanes—Dr. Spengler asked this question—it is very difficult to take an older airplane, like a 757, which is designed around 8 or 9 CFM per person, and boost it up. You could boost it some, but as the Boeing people will tell you, airplanes are designed right to the limit. The duct velocities are about as high as you can get them. You go much higher and you are into structural problems.

Mr. OBERSTAR. So the range of choices to deal with this problem is fairly limited—the filters, the amount of outside air, and the velocity of air flow within the aircraft and consequent turnover of air within that aircraft per hour?

Mr. HALFPENNY. Yes, sir.

Mr. OBERSTAR. Whatever that mix is, is it going to have some effect on cabin air quality?

Mr. HALFPENNY. All of those will, definitely, and all of them are difficult to retrofit older airplanes.

Mr. OBERSTAR. If a more advanced type of filters were used on board aircraft that would remove more contaminants, if there were such a device. At what point do you have to improve over what is now the standard to achieve some higher level of removal of contaminants aboard aircraft?

Mr. HALFPENNY. Well, the only contaminants I can speak to are the chemicals, and activated charcoal has been abused and abused and probably used in some of these buildings to remove odors and chemical agents.

Bacteria, I would defer to experts.

Dr. BURGE. The filters that are in use will as Mr. Halfpenny said, very effectively trap bacteria. However, in the aircraft with recirculation that we studied, the bacterial levels were consistently higher than in those aircraft without recirculation. The air has to pass through the filter before the bacteria is trapped, so that if the air circulation patterns aren't such that the bacteria are picked up and put onto the filter, then they aren't trapped, and you capture them on assembling devices and you aren't exposed to them.

Therefore I don't think increasing the efficiency of filtration is going to make as much difference as changing ventilation patterns with respect to human source bacteria.

Mr. OBERSTAR. You would have to reduce the size from microns to angstroms.

Dr. BURGE. I think the viruses are actually trapped in the HEPA filter as well as bacteria. It is a matter, once again, of getting the air through the filter fast enough so that the viruses and bacteria are trapped before people have a chance to be exposed to them, rather than increasing the efficiency of the filter.

Mr. OBERSTAR. All right. Humidity levels, we know that at some elevated amount of humidity, there are effects on the airframe. There is moisture buildup that has corrosive effects. I know that from our work on aging aircraft and the heavy—extra heavy maintenance required for—and aircraft that are used extensively in humid conditions such as the Hawaiian islands and Central America and some places in South America.

But what is—is there any body of knowledge on what is the range of humidity aboard aircraft before you get to a point that bacteria can build up for molds and other deposits of moisture?

Now, leave aside the corrosive effects. We know there are corrosive effects of moisture.

Ms. BURGE. The moisture problem is not primarily one of relative humidity; it is more a matter of how much water is in the air and how many cold surfaces there are on which that water can condense.

Mr. OBERSTAR. Yes. If I recall rightly, a 727, fully loaded, from the time it backs away from the gate until the time it reaches altitude will drain 120 gallons of moisture out of the cabin.

Dr. BURGE. Right. Which is a lot.

Mr. OBERSTAR. Sure. That is on the people, the clothing, the paper, the materials, and all of that has to condense on the hull and drain around the pitots at the base.

Dr. BURGE. Exactly. But the saving factor is that once you are at altitude for any length of time, those surfaces dry and remain dry for a significant part of each flight so that organisms don't have a change to grow.

Mr. OBERSTAR. At that point can you go to 10 percent moisture, or 12 percent moisture, I mean—I mean, lumber is about 12 percent moisture, dimensional lumber used for building houses. I feel like a piece of board sometimes after a long flight.

Mr. HALFPENNY. Since very few airplanes were ever humidified, we have data which was taken on British Airways, who did humidify their airplanes; and when they ran it above 25 percent, the cold surfaces on both the cabin and the flight station were running wet. In other words, the little joint around the window would be running wet. You could touch it and it would be wet. So they found around 20 to 22 percent was the limit. These were aircraft of the circa 1980 series.

Dr. BURGE. Not only that, but if you try adding humidity to the air you will create new problems. I don't think there is an environmental microbiologist in the world who would recommend adding humidity to an aircraft environment. We have to do something else to protect people's health against dry air. Adding water is not going to be the answer. It is much more dangerous than what we already have.

Mr. OBERSTAR. That is my concern also.

Yes?

Mr. HALFPENNY. I would like to comment on that.

Engineering-wise, Pan Am had some humidifiers at one time that were of a French design that took ordinary water, they didn't treat it, and as the water evaporated, you had all of these salts, which now became airborne.

All the avionics are cooled by suction cooling. The salts began collecting on the avionics, they descended into Hong Kong, the salts got wet and, zip, they had a lot of avionics. They banned them.

There is no airplane today that I know of that humidifies the air.

Mr. OBERSTAR. I am sure Mr. Landry would be happy to hear that.

I think we pretty well covered the waterfront here, if you will, to borrow a metaphor from another transportation medium.

What would you say is the single most important thing we can do, or the two or three most important things that the Department of Transportation, the FAA and the airlines can do to improve quality of air in the short term? End smoking on international flights?

Mr. HALFPENNY. Well, I think probably that is the most—that is very important for crew.

Mr. SPENGLER. Yes. That is useful. I think we are very intrigued by this allergen and endotoxin issue, and I think that has to be pursued. I am not saying, do something about it, not put a regulation in yet. I mean, our samples are too few to extrapolate to the entire industry.

But as we said before, this offers a biological plausibility linkage to the symptoms that we hear reported by the flight attendants. So that has to be examined. And if it bears out, it means there ought to be criteria specifications for the degree of cleanliness of planes.

Mr. OBERSTAR. Any other contributions? You are not willing to be regulators?

Ms. LUDWIG. Well, that was a tough question. You single short-term fix.

Mr. OBERSTAR. Two or three.

Ms. LUDWIG. Or two or three.

But the problem is, in my estimation, there is no short-term fix, because not enough research has been done yet; and the FAA could

have done that or could have taken any one of the recommendations that the National Academy of Sciences made in 1986 and made great strides.

But aside from the things that we know are actually harmful to deal with those—banning smoking, making sure the ozone levels are met, ozone monitors are on board and continuous—I would—if I were emperor, I would make sure that all aircraft had continuous air quality monitoring on board for CO_2 levels, CO levels, ozone levels, perhaps oxygen content levels. I would make sure that there is increased ventilation rate to give the benefit of the doubt that we might remove some of these viruses and bacteria.

I would immediately conduct epidemiological studies for flight attendants and pilots like some foreign carriers have done, because it doesn't look good for the life span of pilots right now. They are dying at a relatively young age considering they can afford the best medical care in the country. Other foreign carriers are making progress in this area, and we need to catch up.

We need to catch up on a lot of this. So I think we are going to need your help, because the FAA has not been doing anything as far as I can see. So I hope you will assist us in the areas of research and in the areas of air quality and in the areas of radiation.

Mr. OBERSTAR. I thank you very much.

Mr. DEFAZIO. Mr. Chairman, could I just follow up on something here for a moment? I won't keep them.

Mr. OBERSTAR. Yes.

Mr. DEFAZIO. To Ms. Ludwig's optimal world, this continuous monitoring, is this extraordinarily expensive or problematic or bulky or heavy? I mean, what instruments would be involved?

Ms. LUDWIG. Again, I asked the Boeing engineer who—again, this is my source of information, because I asked him that same question, who invented the catalytic converters, how expensive would in-flight ozone monitoring would be; and he said would it be relatively inexpensive. I don't know what he had in mind, but I do know there are portable ozone monitoring devices.

This, for example, was invented by a professor at the Harvard School of Public Health which is a very portable, very effective ozone monitor. It is very tiny, it is very small and it is very accurate; and something like this could be used, as well as other devices.

I am sure as soon as you agree that there is a problem, then technology can come to your rescue. But until—if we keep running around like ostriches with our heads in the sand, then technology cannot help.

But these are relatively inexpensive, and they could be used.

As far as CO and CO_2 monitoring and other contaminant levels, I am sure there are contractors out there that would love to bid on something like that, and I am sure all of the traveling public would be grateful for this. In the long term, we don't want to see the mortality rates of the flight attendants and, eventually, passengers take its toll, too, from some unknown thing that is happening out there. We should begin to begin.

Mr. DEFAZIO. And then just one last question——

Mr. HALFPENNY. Could I make a comment, Mr. DeFazio? Everything on an airplane costs a lot of money. You know what toilet seats cost on an airplane.

Mr. DEFAZIO. Well, I assume they are less expensive on a civilian airplane.

Dr. SPENGLER. The issue of monitoring is really relevant to what decision you are going to make—make better, make quicker with the data. I am not as convinced as Sue Ludwig that we need to have routine monitoring on all of the planes. We monitor, in many locations, air quality all over across the United States, and yet the decision-making, we are not doing this on a daily, hourly basis, but we have a lot of data. I don't think that is what is absolutely necessary in this case.

In fact, if they only paid attention to the monitors that are on the plane, which is the people—in effect, they are integrating over all of the experiences, the quality and parameters in the air, and that monitor is not being paid attention to right now. So I think it has to be done very judiciously in terms of what we actually require by way of monitoring.

Mr. DEFAZIO. And just, Mr. Halfpenny, on the 777 where you talked about this nine-to-one ratio, does this mean that the 777 is going to be capable of providing fewer cubic feet per second?

Mr. HALFPENNY. I haven't seen data on the 777 except in a preliminary form. No, it could provide it. It is just going to cost more. It can do it.

Mr. DEFAZIO. Right. But we know how——

Mr. HALFPENNY. Yes, you can do it, but the cost will be higher.

Mr. DEFAZIO. Well, perhaps we can ask Boeing about that. Thank you.

Mr. OBERSTAR. Thank you very, very much. You have been a most helpful and instructive panel.

Ms. LUDWIG. Thank you.

Mr. OBERSTAR. Our next panel includes Mr. James Landry, President of the Air Transport Association, accompanied by Dr. Jolanda Janczewski, Consolidated Safety Sources, Inc.; and Mr. Michael Rioux, Vice President of Engineering, Maintenance, and Materiel, Air Transport Association.

TESTIMONY OF JAMES E. LANDRY, PRESIDENT, AIR TRANSPORT ASSOCIATION, ACCOMPANIED BY DR. JOLANDA JANCZEWSKI, PRESIDENT, CONSOLIDATED SAFETY SOURCES, INC.; AND MICHAEL RIOUX, VICE PRESIDENT, ENGINEERING, MAINTENANCE, AND MATERIEL, AIR TRANSPORT ASSOCIATION

Mr. OBERSTAR. Mr. Landry, you have been most patient there, taking all of this testimony in and nodding your head and shaking your head from time to time and making careful notes, I have observed, in your usual studious and meticulous fashion. And you have absorbed the bumps and shocks and occasionally some bouquets thrown your way, and now it is your turn.

I think this last panel helped you a great deal, as a matter of fact, knowing the viewpoint that you bring and the perspective. And you have submitted a very thorough statement in your usual

fashion on behalf of your association. We look forward to your presentation.

Mr. LANDRY. Thank you, Mr. Chairman. Indeed, I was gratified to hear some of the comments by Dr. Spengler during the last panel's presentation. And, indeed, I do like to—I have always recognized that you are a keen observer of body language, so I like to nod, do a variety of things to let you know how I am reacting to things.

I am Jim Landry, President of the Air Transport Association. ATA's member airlines transport more than 95 percent of all passenger traffic in this country. I am accompanied today by Mike Rioux, Vice President, Engineering, Maintenance, and Materiel, for ATA, and Dr. Jolanda Janczewski, President of Consolidated Safety Services, Inc. I appreciate the opportunity to appear before the subcommittee today to discuss the issues of airline cabin air quality, in-cabin insecticide spraying, and smoking on international flights.

I will take up each of those topics in turn, and understand that the full statement we submitted will be included in the record of these hearings.

First, on the issue of cabin air quality, let me say a few words before deferring to my colleagues. The environmental control systems on transport aircraft are designed to meet or exceed FAA requirements and aerospace industry standards and guidelines for air quality and air distribution. Aircraft design criteria also satisfy health guidelines established by OSHA and the American Conference of Governmental Industrial Hygienists.

A 1989 study, funded by the U.S. Department of Transportation, was conducted to quantify pollutant levels in airline cabins and to assess the associated health risks. Tests were conducted on 92 flights, and the levels found in the study were below the levels thought to pose health risks.

The airline industry has always viewed safety as its top priority, and thus the health and welfare of our passengers and employees is a major concern for the industry. While previous studies, such as the one completed by DOT, provide valuable data, ATA just completed another study of airline cabin air quality in order to assess the validity of recent complaints. ATA contracted with the firm of Consolidated Safety Services, Inc., CSS, to do a comprehensive study of aircraft flown by U.S. airlines.

I would like now to have Dr. Jolanda Janczewski, the President of CSS, summarize that study. Dr. Janczewski holds a Masters in Public Health, in Biohazard Sciences from the University of North Carolina, and a Ph.D. from George Mason University in Environmental Health and Public Policy. She specializes in workplace disease transmissions.

I understand that, before she summarizes the study—I think because she has also sat here throughout this hearing today, that she would like to make a couple of comments and then summarize the study itself.

Jolanda.

Mr. OBERSTAR. And if you wish to comment on any of the previous testimony, please do so at this time.

Ms. JANCZEWSKI. I will be as brief as possible because it seems to me that everybody has heard about the results of the study. In

fact, I have heard more details on things about this study than I even knew existed about this study before today. But before summarizing how we conducted the study and a little bit about the results that we found, I would like to make a statement that—I, unlike Mr. Landry, have not been sitting in the back of the room patiently all day long; I have been sitting back listening to everybody make comments—several witnesses to make comments about our company and the study not being biased.

I think the fact that anybody who insinuates that Consolidated Safety Services would be biased by a client is to make disparaging remarks about our firm, and being an occupational safety and health consulting firm, I certainly take exception to that. ATA has been a client of ours, as have been the Centers for Disease Control, the Occupational Safety and Health Administration, the National Institutes of Health, the Department of Defense and the Food and Drug Administration. We pride ourselves on being an objective firm.

It is our job, as a safety and health consulting firm, to inform our clients if they have a problem; and we are often the bearer of bad news. We do not bias our studies in any way, and I certainly take exception to anybody making a remark in that direction today.

Having said that, let me briefly go over the methodology of the study and what we did; and then I am certainly willing to answer any questions you may have on the results any time later on.

As you understand, the Air Transport Association of America had hired us to conduct this study for them and to do a comprehensive airline indoor air quality evaluation. The study had examined environmental parameters and indoor contaminants aboard 35 flight segments, which were comprised of newer types of aircraft and older types of aircraft. As examples of newer-type aircraft, we used the McDonnell Douglas MD–80 and the Boeing 757, and the two older types of aircraft included the Boeing 727 and the McDonnell Douglas DC–9. These were provided by eight top U.S. passenger carriers.

A minimum of eight flight segments were evaluated for each type of aircraft and four segments for each carrier. In all cases, monitoring was intended to be and generally was conducted surreptitiously, without the knowledge of the cockpit crew. Flights were selected at random by Consolidated Safety Services and without consultation with the Air Transport Association or its members.

Evaluation of cabin air quality is based upon the analysis of, comparison and relationships between a multitude of factors. No single measurement of environmental contaminant or condition is a sufficient basis from which to draw conclusions about air quality. Therefore, we conducted continuous monitoring and used equipment that was—that gave us flight duration profiles for several environmental parameters, including carbon dioxide levels, temperature, relative humidity and noise.

I should mention at this point that we did not sample for ozone, so the comment made earlier by Ms. Ludwig that she had less of a margin of error in her study is certainly correct, because even if she conducted one flight segment, that was certainly more than we did for ozone. So our study cannot be compared to any ozone studies that are out there.

In addition, single air samples were taken during the early phase of each flight segment, as well as the late phase of each flight segment, to obtain quantitative and qualitative analysis of bacterial and fungal contaminants.

The results of our study indicated that the levels of contaminants found in airline cabins are not likely to cause adverse health effects. While the air may be dry due to the intake of little ambient water vapor at cruising altitude, like we have all heard discussed today, incoming fresh air is likely to be cleaner than that of most indoor spaces on the ground and the dryness may be beneficial in hindering the growth of microorganisms that could cause potential health risks in cabin environments.

Other common indoor contaminants, including the voluntary organic compounds, the virus particulates were found at levels low enough to indicate that adequate ventilation is being supplied to the cabin environment. They would also indicate that all contaminant levels, including biological particulate and voluntary organic compounds, are directly proportional to the number of cabin occupants, indicating the source of most contaminants are people and their activities.

Even then, airline filtration systems for all type of aircraft are more than sufficient in removing contaminants from the air inside the cabin. The results of the study therefore do not reveal a potential for human health hazards. Total average levels for VOC bacteria and fungal contaminants were relatively low for all types of aircraft, seating configuration, flight duration and airlines.

While we do not dispute the fact that flight crews, flight attendants, may be experiencing adverse symptoms, the data from our study, as well as that from others conducted to date, including that performed by Harvard University, simply do not support the hypothesis that these illnesses are directly related to the quality of air in airline cabins.

Thank you.

Mr. LANDRY. Thank you.

Mr. Chairman, before closing this portion of our testimony, I would like to comment on several aspects of the cabin air quality issue which I hope you and the subcommittee Members will take into account during your discussions.

Some allege that the industry's move to a recirculated system was part of a scheme to simply save money, since these aircraft are more efficient to operate. While I will defer to the testimony of aircraft manufacturing representatives to explain the details and benefits of these recirculation systems, there are a couple of points to consider.

These new aircraft systems were designed during a time when the entire U.S. economy was grappling with the energy crisis of the 1970s, when office buildings were designed to increase energy efficiency by sealing windows, automobiles were engineered for better gas mileage efficiency. The introduction of recirculation systems represented a major breakthrough in technology that helped to reduce energy consumption and maintain high cabin air quality.

Recirculation systems were not designed to sacrifice passenger and crew health as some sort of trade-off. The fact is, the air quality of aircraft using recirculation systems exceeds that in most of-

fices and other public buildings, probably including this hearing room, and certainly in my home, graced as it is with a wife, two children, two dogs, a cat, and an army of germ- and dust-bearing children from the neighborhood.

We are not here to say that the industry wishes to simply dismiss the complaints about the effects of airline travel, and we have taken several steps reflecting our concern over the safety, health, and comfort of our passengers and crews.

In 1993, ATA, along with aircraft manufacturers, the Aerospace Industries Association and the American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) formed a cabin air quality task force to review the current ASHRAE standards for air quality and to develop cabin air quality educational materials and travel tips for the public. As part of this task force, ATA has just published a consumer brochure, which I hold for your view, to remind passengers how to alleviate any discomfort and is also working with the Aerospace Medical Association to update the medical criteria for passenger travel.

I will be happy to supply these to all of the Members of the committee.

In conclusion, the findings of the CSS study, in combination with numerous other government reviews, support the conclusion that cabin air quality poses no health risks.

Airline travel can be taxing on the body. It takes one across multiple time zones in a very short time period in an environment that is dry. Passengers and crew members should prepare themselves accordingly, such as getting adequate rest, drinking plenty of water, and fruit juices to keep the body hydrated, and removing contact lenses on long flights. If more fresh air were introduced at altitude, it would only lower humidity levels further and increase passenger discomfort.

Passenger aircraft have been designed to maintain a quality environment, and airlines can and do operate their aircraft to make the cabin environment a healthy one.

Let me turn next to the topic of aircraft insecticide spraying on international flights. We believe approximately 20 countries, mostly in Central and South America and the Caribbean, presently have legal requirements that arriving aircraft be sprayed with insecticide before hatches are opened upon landing. We understand that Australia and New Zealand also require disinsection of aircraft—though apparently these nations allow, as an alternative, the periodic treatment of empty passenger cabins with more powerful residual pesticides.

Aircraft spraying is endorsed by the World Health Organization for the purpose of eliminating insects that purportedly may carry agricultural or human disease. Though we do not believe that the insecticide used aboard U.S. flag aircraft in flight, which is registered by the U.S. Environmental Protection Agency, poses a health concern to the overwhelming majority of passengers, ATA member airlines applaud the efforts of the Departments of Transportation and State to encourage foreign nations to discontinue these spraying requirements.

An HEW rule issued in October of 1979 provided that the Centers for Disease Control may require disinsection of an aircraft if

it arrives in the U.S. from an area that is infected with insect-borne communicable diseases and is suspected of harboring insects of public health importance. In December of that year, after considerable discussion and careful consideration, the CDC hierarchy unanimously concluded that there was then virtually no risk of disease transmission from insects aboard the aircraft and that aircraft arriving from foreign airports need not be disinsected. Subsequently, our government found that aircraft insecticide spraying has limited effect in killing stowaway insects. More importantly, our air carriers wish to avoid, if at all possible, any practice that may cause discomfort or the possibility of allergic reaction for any passenger or crew member.

Through no fault of their own, the U.S. airlines, along with their passengers, are caught between the proverbial rock and a hard place on this issue. If the carriers were to refuse to spray, they would be in violation of international agreements, receive fines imposed by foreign governments, and likely still be subject to having aircraft sprayed by foreign governmental agents upon arrival at the gate prior to disembarkation of passengers.

Even Section 1102 of our own Federal Aviation Act explicitly recognizes that our carriers must comply with obligations and duties imposed by foreign countries.

Also, since EPA registration standards would not then apply, the airlines would have no control over the type of insecticide dispensed. Moreover, refusal of U.S. carriers to comply with foreign spraying requirements could possibly lead to denial of landing rights. In such a case, passengers wishing or needing to travel to these destinations would be forced to fly on foreign airlines, thereby being denied the competitive service of U.S. airlines, and they still would be sprayed with insecticide containing unknown chemical agents while en route.

With regard to nations that may allow periodic residual treatment of aircraft as an alternative to spraying during each flight, we have been informed by EPA pesticide registration officials that no pesticides currently are registered in the United States for residual treatment of aircraft passenger cabins. Thus, U.S. carriers could only employ this option if the treatment was conducted abroad, using foreign-made pesticide.

Mr. LANDRY. Moreover, EPA has not examined the potential health risks associated with this method of disinsection. Although the problem of direct inhalation of pesticide would be avoided, passengers would still come into contact with longer-lasting insecticide chemicals in the fabric of aircraft seats. Thus, the residual treatment alternative is not an acceptable solution.

Finally, to the extent that some nations may persist in requiring arriving aircraft to be sprayed prior to landing, ATA calls upon EPA officials to clarify the agency's position promptly with regard to continued registration and use standards for aircraft insecticide.

We understand that the agency has issued a data call-in to Airosol Company, Incorporated, the sole registered manufacturer of insecticide authorized in the United States for use in flight with passengers aboard. This data call-in requires the manufacturer to submit the results of extratoxicological testing conducted at consid-

erable expense of Airosol in order to maintain its pesticide registration.

Obviously, the demand is quite limited for insecticide manufactured specifically to meet the nonflammability and noncorrosiveness requirements for use in aircraft. Accordingly, since this pesticide is not a major product for Airosol, any unnecessarily costly or time-consuming registration requirements may have the effect of encouraging Airosol to cease production.

We have been informed that in light of recent negative publicity, Airosol has only reluctantly agreed to continue production, primarily as an accommodation to the airlines and their passengers.

If the pesticide registration and use requirements become too onerous, however, the situation may exist where no EPA-approved product is lawfully available for airborne use in U.S. flag aircraft. Under these circumstances, U.S. carriers would have no choice but to accede to foreign government demands that planes be sprayed upon landing with foreign pesticides prior to passenger disembarkation.

For these reasons, ATA urges State and Transportation Departments officials to vigorously pursue efforts to encourage other nations to rescind their insecticide spraying requirements, and to continue their consideration of a governmental notice to passengers flying to countries which do not rescind their requirements.

Lastly, the issue of smoking on international flights. While smoking on domestic U.S. flights has been eliminated, the issue of smoking on international flights to and from the U.S. continues to be debated. The U.S. airline industry supports the efforts by the International Civil Aviation Organization to achieve a smoking ban that will lead to uniform worldwide guidelines and rules. The U.S. Government's efforts to facilitate such an agreement are fully supported by the industry.

However, any such ban must be fairly and consistently applied to both U.S. and foreign flag carriers. I was gratified to hear Deputy Assistant Secretary Canny report this morning that substantial progress is being made in the negotiations to ban all smoking on several Pacific routes.

ATA member carriers are looking at and experimenting with nonsmoking flights in specific international markets. The consumer reaction to those efforts cannot yet be measured. Therefore, the industry views any proposal to impose a unilateral smoking ban on all international flights of U.S. airlines as a policy that would create a tremendous competitive disadvantage for U.S. carriers who serve nations and regions of the world where smoking is not a public health concern and is still an accepted practice of that culture.

Thank you, Mr. Chairman. That is the end of my comments. We have the AIA panel members as well.

Mr. OBERSTAR. Are there other witnesses who have statements?

TESTIMONY OF ROBERT E. ROBESON, VICE PRESIDENT, CIVIL AVIATION, AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, ACCOMPANIED BY TOM NAGLE, BUSINESS UNIT MANAGER, ENVIRONMENTAL CONTROL SYSTEMS, McDONNELL DOUGLAS CORP., AND NEAL NELSON, CHIEF ENGINEER FOR MECHANICAL SYSTEMS, BOEING COMMERCIAL AIRPLANE GROUP, SEATTLE

Mr. ROBESON. Yes, sir. Good morning, Mr. Chairman, or afternoon, I guess, now. Morning if I am in Hawaii. No such luck. My name——

Mr. OBERSTAR. Morning somewhere in the world, but not here.

Mr. ROBESON. Actually the last time I was in a plane that got sprayed was coming back from Hawaii to the mainland. That was a while back.

I am Bob Robeson. I am Vice President, Civil Aviation, the Aerospace Industries Association. I am accompanied today by Tom Nagle, Business Unit Manager, Environmental Control Systems, McDonnell Douglas Corporation, and Neal Nelson, Chief Engineer for Mechanical Systems, Boeing Commercial Airplane Group in Seattle.

Along with my written statement, I would like to enter for the record an article from Boeing on air quality. The rest of my time I will summarize the written statement which we provided earlier.

For the manufacturers, our primary requirements for aircraft environmental control systems—parenthetically, these requirements are the same that we apply to any part of the airplane, and that is aircraft safety and the safe arrival of our passengers in a healthy condition—the goals that we pursue are comfortable and passenger-pleasing environments which are compatible with affordable transportation.

And we draw a distinction between the requirements of the aircraft and the goals. My personal goal is an airplane with 60-inch pitch for all seats, but it is not a requirement.

The air quality environment provided in a modern jet aircraft is better and more positively controlled than in any other mass transit vehicle. The air in aircraft when flying is cleaner than any introduced into ground vehicles or buildings. And the air exchange rates are several times the rate found in buildings. Air circulation is well controlled, as is passenger location.

And our point here in making this is that we feel that the comparison between buildings and aircraft is basically a flawed comparison for reasons we will discuss in a moment.

Air flow in aircraft is developed ceiling to floor, which allows it to reach the passenger head location as soon as possible without undue collection of odors, and longitudinal flow of air, that is, air flowing fore and aft through the cabin, is minimized.

Aircraft recirculation systems have filtration on a par with that found in hospitals, and we have already discussed particle sizes on the other panels. We concur with those discussions.

We want to emphasize the on board filters have no bypass capability, that is to say, anything that is recirculated must go through the filters. The filters' equipment functions also are very tightly controlled in the aircraft, as are devices carried onto and operated on the aircraft, apparently with the exception of nail polish. The fil-

ters reduce and control emissions from these items, while air from galleys and lavatories is vented overboard.

We are not aware of technical evidence that unsafe or hazardous air quality conditions exist on aircraft. Tests run on aircraft environments, we believe, have tended to support this position, and those tests have already been discussed. Various studies have been discussed. And we think they have generally been consistent.

We think that the air quality is generally similar to what you would experience in a high-altitude mountainous area, with elevations limited by regulation to a cabin elevation equivalent of 8,000 feet. The cabin air is generally dry with humidity levels of less than 20 percent, not unlike humidity levels found in many of the semiarid regions of the United States, such as the Southwest.

We believe the proposals to add moisture to the air fail to take account of the two primary requirements which are aircraft safety and passenger health. Passenger health has already been discussed. There is a propensity for high levels of moisture to provide breeding grounds for bacteria.

We do have concerns that are related to the proper function of the aircraft. In this hearing the issue of corrosion resulting from condensation has already been mentioned. We also are concerned about the potential for freezing of aircraft systems. For example, the possibility that perhaps a door mechanism might freeze. So we believe that that could give rise to an unsafe condition.

Mr. Landry noted that AIA, the ATA and ASHRAE have formed a cabin air quality task force. I don't want to dwell on that since it has already been mentioned, other than to say that the purpose of the group really is to have a program of education, but also this working group is looking to implement appropriate action that could result in a sound air cabin quality standard.

That is why it is so important to have ASHRAE involved, because as we mentioned, there is a distinction between air quality standards applied to buildings on the ground, and we believe there does need to be work done in the area of establishing appropriate standards for aircraft cabins.

I would like to cut to the chase here, which is where we are in terms of our conclusions. Aircraft manufacturers by and large are a bunch of engineers, and these types of people take a very scientific and technical approach to problems, and we believe that is what is warranted in this area. We are absolutely committed to providing a safe product and a healthful product for our customers, that is, the airlines, and ultimately our real customers, the traveling public.

To that end, we welcome and will carefully review all scientific evidence that is relevant to this issue. We would support the kinds of efforts that were mentioned in previous panels, of studies to correlate cause and effect, of efforts to take a systematic look at previous studies and search out inconsistencies and see where we have to go from here.

At this time, we do not believe that the evidence warrants new regulation. But that position could change depending on what we find in these studies. We do think if there is a decision to proceed to rulemaking, the appropriate place to do this would be in the aviation rulemaking advisory committee, where all of the parties

who are interested in this could sit down together and see whether we can come to a consensus on whether there is an issue here, as identified by the kinds of studies that have been discussed, and then what the appropriate solution to that is.

We would further urge, and I think that this has been alluded to in some of the earlier statements here, that any regulation should be based on a standard which defines the air quality to be achieved, and that once that technical standard has been defined, the designers should be free to develop the best and most efficient means for meeting the standard.

At this point, Mr. Chairman, I would like to close my prepared remarks and turn the floor back to you, sir, for any questions. We are prepared to answer.

Thank you.

Mr. OBERSTAR. Thank you very much.

We will go next to Mr. Nagle.

Mr. NAGLE. Mr. Robeson gave a presentation. We are here to support him.

Mr. ROBESON. Mr. Nagle and Mr. Nelson are here to provide answers to any technical questions you might have, such as the operation of air packs on different airplanes, filtering systems, the kinds of questions discussed in the last panel.

Mr. OBERSTAR. Mr. Nelson.

Mr. NELSON. Yes, I might start out by giving you some information that might clarify the many different designs that have been reported to be on our aircraft. I will try to do this very quickly.

When the 747 first came on board in the 1970s, it was in the midst of a fuel conservation era. It was also a time when we had three crew members in the cockpit and all systems were set up for manual operation. And the kinds of operation for the early 747s only have been alluded to several times. There is a lot of flexibility. In fact, even the Boeing maintenance manuals told how to cut the air supply down if there was less than a full passenger load.

The whole emphasis was on saving fuel. Newer airplanes, with the two-crew operation, have taken an entirely different philosophy. I think it is growth. For instance, on the 747–400 we still have three air conditioning packs. If one of those packs is turned off, another pack will kick up to what we call a high-flow mode, which doesn't completely replace the flow from the other pack, but it replaces about 60 or 70 percent of it. So any fuel savings would be negligible.

The same thing happens when the recirculating fans, which drive the 50 percent recirculation, if they should fail, in order to keep the total ventilation velocities up, then the air packs kick up again to a high-flow mode. And Boeing has gone on record that the normal operating condition for a 747 is all three packs operating on their normal position.

Now, this high-flow position is not a position that can be selected for an entire flight, for several reasons. It would take engine thrust away during take-off. It would cause undue strain on the system and on engines as well as fuel consumption. It is way off the design point.

As someone else mentioned, the aircraft was designed with all of its systems operating in conjunction with one another, and a

change in one system affects all other systems. But if all systems are operating at their normal capacity, then the total 20 cubic feet per minute, which includes at least 10 cubic feet per minute of fresh air, is maintained throughout the flight.

Our new airplanes have only two packs, and if one of those packs fails, the other one kicks into this high-flow mode, which is nearly equivalent. The recirculating fans, of course, stay on and do their part. Also, if the recirculating system should fail, the pack will go into high flow to make up for it.

So there is very little control short of, as Mr. Nagle said earlier, reconfiguring something with circuit breakers or some unusual, not per-the-book operation. And I think there could be a lot gained if flight crews and cabin crews were to discuss these things and understand the operation a little bit better so their communication would be good.

Thank you.

Mr. OBERSTAR. Thank you very much.

Mr. Clinger.

Mr. CLINGER. Thank you to the panelists who have given different insights to the problems we have been discussing.

Just to start with you, Mr. Nelson, in your testimony you indicate that perhaps the nexus or the connection between any illnesses or problems that may be experienced are not attributable to the lack of ventilation but rather attributable to the fact that planes are operated up in the air, and therefore the climate is somewhat different or would be comparable to the climate, I think you say you would find on roads at 8,000 feet.

Do you see this as just a situation that can't really be remedied by better ventilation, because of the fact that the plane is flying in the air?

Mr. ROBESON. Let me give a preliminary response and turn it over to the pros from over on either side.

I think in our business we never say never. There is always room for improvement. I don't think we would claim that there are not side effects or ill effects that may be suffered by flight crew in the environment in which they operate.

We think that some of that may be attributable to the nature of the environment. It is a dry environment. It is a relatively high-altitude environment, even though it is 8,000-foot equivalent. I think what we are concerned about is that there may be proposals for solutions before we fully understand the problems, and that is why we would support further study, not because we want to drag it out, but because we want to do the right thing.

It costs a lot of money to change the configuration of an airplane. There are hardware changes you have to go through. There is certification cost to certify and validate those hardware changes on the airplane. It is not cheap.

And we want to do the right thing. We don't want to do something which would make the situation worse, such as we believe would be the case with the proposals to add humidification to the airplane, for example.

I will call on my colleagues.

Mr. CLINGER. The testimony by Ms. Ludwig and others claim that ozone and radiation are problems that have to be considered

in shaping any kind of solution to this problem. Do you see those as significant problems?

Mr. ROBESON. The question is, how significant. Neither of these is a particularly new issue. And we would support the kinds of proposals put forward in the previous panel to see what the situation is with respect to ozone and come to the appropriate solutions.

I might at this point defer to Tom and to Neal because they do have some specific information that they have gleaned during the course of this hearing. They stepped out and got some information on the ozone filters, which Tom has, if I can turn that over to him.

Mr. CLINGER. Mr. Nagle.

Mr. NAGLE. The ozone filters on our DC–10s and MD–11s are checked regularly by the airlines. We establish—and unlike prior testimony that said it is not controlled by the FAA, we develop a material review board document that is submitted to the FAA and approved, and once it is submitted and approved by the FAA, it becomes an active document on the aircraft that the operators follow.

On the ozone filters, Douglas has developed a procedure to test the efficiency of those ozone filters, and we submit that document to the FAA and to the operators. The operators develop their own check of that efficiency and the frequency of that check based upon their operating environments, how dirty the air is they fly in, because of dirt contamination is the primary reduction in efficiency.

To date we have found that the filters on the DC–10 last about 16,000 hours before efficiency degrades below the specified performance. And it looks like the statistical data is leading us up to the fact that it will go up to about 18,000 hours. The only thing that has an abrupt effect on this is an unusual event on the aircraft, such as skydrol poisoning to the filter. Usually those effects are detected by the airlines, and the airlines do a specific test for those.

The fact that we get into ozone—and to differentiate that from the ASHRAE standards, ASHRAE proposes no building standards for ozone because there is no need to. This in itself points out the need to have something specific for airlines and not to continuously relate the building activity to what goes on in the aircraft.

Mr. CLINGER. Assume for a moment that the government—and this could go to either Mr. Landry or others—that the government were to require 100 percent fresh air on commercial aircraft. What are we talking about in terms of converting modern aircraft from 50 percent fresh air to 100 percent fresh air? How much of a job would that be? How much of a cost are we looking at?

Mr. NAGLE. After your last hearing, we replied to FAA questions as to the cost of this modification. The actual and only mechanism that we could use on our current aircraft today would be to reduce the passenger load such that the effective air quantity would be what would be required for 20 CFM per occupant.

That, in itself, for our MD–80s, would be a 60 percent increase in ticket price and for our MD–11s, almost a 100 percent increase in ticket price, because we would be reducing the seat capacity proportionally on those airlines.

That is essentially the airplanes today have a balanced system design. The engines are bleed limited. They can go into surge conditions if you overbleed the engines. You can't extract more bleed

than you have today. We have bleed systems to support ice protection as well as the air in the cabin. All those systems have to be accounted for.

If you got into a condition where you were doing ice protection plus increasing higher flow rate, you would be exposing the engines to some conditions where they could have abrupt failure because of surge. The only way you could increase air flow per occupant is to limit the bleed flow that currently you have from the engines to what you have today, and that means you would have to offload passengers to get down to the 20 CFM per occupant.

Mr. LANDRY. Can I add that for an industry that has lost $12.8 billion over the last four years, you have certainly brought us good news.

Mr. CLINGER. It is hypothetical.

Dr. Janczewski, we have heard about the study that you conducted for ATA and others and the Harvard study and the study Ms. Ludwig did on her own. Are they comparable, and if so, why do you think they may have reached different conclusions?

Ms. JANCZEWSKI. I think Dr. Burge, I certainly would agree with her that we have all basically come out with the same data. There are some slight differences on a few of the parameters. But we are all coming out with the same basic set of numbers.

It is how everybody is interpreting it that is still up for debate. The whole issue of indoor air quality, whether it be in an airline cabin or in a building, is not somewhat a hard science but rather somewhat a soft science, subject to a lot of subjectivity, because it is a newly evolved science. I have only had these problems around since the early 1980s.

So we are still trying to figure out what exactly—what symptoms do we equate with what environmental parameters. So you are going to see throughout this science evolving a lot of differences of opinion. A lot of us tend to specialize in one area or the other, so that is where we seem to emphasize our data-collection programs. It is not to say anybody is right or wrong, but it certainly does tell us we don't know enough about the issue yet to make conclusive remarks.

Dr. Harriet Burge had made the statement that we can't say conclusively that the indoor air quality in the airline cabin is not a problem, but on the other side we can't say it is a problem either.

So I don't think it is a matter of anybody being bad or good or wrong or different.

Mr. CLINGER. You are saying there is a subjective element here?

Ms. JANCZEWSKI. Oh, certainly there is. This early in the science, there certainly is.

Mr. CLINGER. Thank you, Mr. Chairman.

Mr. OBERSTAR. Mr. DeFazio.

Mr. DEFAZIO. Thank you, Mr. Chairman.

To the ATA, how many flight segments are flown per year? A million?

Mr. LANDRY. Seventeen thousand a day.

Mr. DEFAZIO. Times 365?

Mr. LANDRY. Times 365.

Mr. DEFAZIO. It is going to be 4 million or more. Whatever.

Mr. LANDRY. Seventeen thousand flights—here we are. We have the bible here. In 1992, there were approximately 7 million flights during the calendar year.

Mr. DEFAZIO. So we had a sample where we are saying we have a dispositive study of 35 flight segments which on a daily basis, what perçentage, 35 of 17,000, I don't know, pretty small——

Mr. LANDRY. Small, but we believed it was representative of—

Mr. DEFAZIO. Over a number of days, we have a dispositive result.

Mr. LANDRY. I think I will ask the good doctor with her very good educational background to tell you whether that is a representative sample. I believe it is.

Mr. DEFAZIO. Thank you. I would like to know the sampling methodology and whether I found fault with the FAA when in fact they did not, after sampling, control for how the planes were operated.

Did you control—I mean, did you interview the pilots afterwards, particularly in the older generation of aircraft, which have different operating capability, and ask them at what percent or what number of packs they had been operating and what percent, or was it not done?

Ms. JANCZEWSKI. No, we didn't do that. As a matter of fact, that is a very good point, that it is important as you are doing any type of indoor air quality study to gather as much data as you can, occupant surveys along with it, ventilation data, not to say you can't look at these parameters and get an indication or feeling of what is going on.

We didn't because the airlines didn't know we were on board doing this sampling. However, we were told if we saw a severe problem with any of the aircraft that we would be able to get back to the individual airlines and the aircraft manufacturers to try to figure out if that particular flight had a problem. But we never had an incident where we had to do that.

Mr. DEFAZIO. Right. So would you as a scientist then recommend that perhaps in order to be more confident of our results, we should undertake a little bit more robust testing?

You admitted that we don't know enough. What should we do? Should we follow the doctor from Harvard who suggests we need epidemiological studies? Should we follow another route and do more air sampling on a much larger selection of flights, including some sort of control for how the planes were operated so that we are know why the air conditioners were what they were on board?

And then the third question would be, why didn't you test for ozone?

Ms. JANCZEWSKI. I am going to be fascinated to talk to Ms. Ludwig later on and find out how she did it.

Ozone is a very difficult substance to sample for. There are two types of instruments you can use for sampling: Those you normally use in a laboratory, and those that would be good because they are portable. Ozone normally you would have to have what is called an impinger. You would use a glass vial that has a solution in it. You would bubble the air through and trap the ozone. The pumps that you need to draw that air in, and you need to plug the pump in,

and it is very difficult not to let the flight crew or the passengers know you are doing it on the aircraft.

What you could do is use what is called Yager tubes, one-shot color tubes that turn a different color depending on the level of a chemical you have in the air, but it only gives you a snapshot of that particular period of time, not the whole flight duration, and does it move up or down or does it stay the same, or did you just happen to catch it at that one second when it was a bad moment.

We have no way to do it in the field where we would feel that the data was credible at this time. I know that Dr. Spengler, I think the group at Harvard has been experimenting with a lot of ways. They have got some novel approaches perhaps that we will all be interested in seeing real soon. That is why we didn't do it, because of the lack of commercially available equipment right now.

Mr. DEFAZIO. Or the equipment that would have made your covert activities——

Ms. JANCZEWSKI. No longer covert, exactly.

Mr. DEFAZIO. Let's say an agency wanted to monitor ozone, there is technology available and we could monitor it, and it could be in a seat or some area in the plane.

Ms. JANCZEWSKI. Right, you could do that. It would be cumbersome, but the agencies could do that, certainly better than we could.

Mr. DEFAZIO. Does ozone have deleterious health effects, to the best of your knowledge? We have certainly heard some testimony earlier that it does.

Ms. JANCZEWSKI. Certainly ozone can be a problem. I don't know whether it is on board airlines. The old studies from GEOMET and the sampling ability to sample for ozone back then was even more crude than it is now.

So it certainly pays to go—this sort of answers your second question—to go back and collect some more data. Not only has the science of indoor air quality been evolving rapidly, but so has the technology of sampling equipment. What we have used today could not be used during the GEOMET study. It just wasn't available. We are able to do continuous monitoring throughout the whole flight so we can watch every minute how the chemical levels are looking, how the CO_2 levels are looking.

Back in the GEOMET days, all they could do is take a sample during the flight and divide it over the flight's duration. We have much more sophisticated equipment. All the more reason to go out and collect new data. If you are going to base policy decisions on science, it needs to be the most recently available science and the most sound science you can get your hands on.

I would agree with our colleagues at Harvard, epidemiological studies are important. Anecdotal findings, while not scientifically sound, are also important to collect. Occupational studies are important.

So I believe that is our key to trying to solve this problem. It is collect the data, then look at the policy issues and see whether the policy is truly the way to proceed. Is it relevant? Are you going to fix one domino but knock the rest down? Before you decide to take a step, I would just urge you to be sure that you do things right instead of do things fast.

Mr. DEFAZIO. Thank you.

Mr. Landry, I hope you are here for the EPA. The EPA is concerned. What I read was actually from the label. The label does say it is not to have human contact. And the EPA is disturbed that this is what is being used on planes since it is not supposed to be inhaled, it is not supposed to come in contact with your skin, mucous membranes, eyes, or whatever.

So I appreciate the level of concern you express, but I would urge—it would be much better if you came in and said, Congressman, we don't want to spray pesticides on our passengers. We have read the labels; that doesn't sound like something I would want to inhale. No one has yet volunteered for a breathful of this stuff. And this is a little less toxic.

Mr. LANDRY. Let me try and please you right now. Congressman, we don't want to spray our passengers. I wrote to the Secretary of Transportation at the end of January, and said, Would you please, please, through diplomatic channels, see to it that this requirement is lifted by all of the nations that are imposing it upon us.

That is slowly under way now through diplomatic channels, which I am sure you know do not move with lightning speed.

Mr. DEFAZIO. Sometimes we try and break through diplomatic niceties and protocols. With the support of the industry, perhaps we can do that. What Senator Leahy and I have determined, in part these countries have based their supposition on a WHO standard, and we are hoping we can get WHO to change its standard, which perhaps is not too difficult, I don't know, since we pay a substantial portion of their bills.

Mr. LANDRY. I am sure we do. We really don't care whether you attack the engine or the caboose. We would like to get rid of this requirement. We have been contacting ourselves flag carriers in foreign nations. I think most of the aviation community considers this an anachronism at this point in time, left over from an ancient WHO requirement, which our own government investigated 15 years ago and said, Stop it.

Mr. DEFAZIO. I am pleased to hear that. Thank you.

Mr. LANDRY. I knew I would please you.

Mr. DEFAZIO. That is wonderful.

Now if we could—just a couple of more questions, Mr. Chairman.

I am a little puzzled on, Mr. Nelson, the new 747. So it operates exactly the same no matter how many passengers are on board?

Mr. NELSON. Yes.

Mr. DEFAZIO. In the old days you would apparently adjust them having to do with the number of passengers on board. Apparently these new planes just operate the same no matter whether anyone is on board or not?

Mr. NELSON. The operating manuals say place all instruments in normal position and then go. If there is a fault, also because of the two-crew, in order to relieve the workload, the reconfiguration of the system to accommodate the fault is automatic. This is why all the new two-crew airplanes tend to have automatic reconfiguration.

Mr. DEFAZIO. Sure. So design a system which can't be—so it seems to me if in the old days we could save fuel by perhaps turning down the packs, and we had fewer passengers, you designed something that—I mean, it doesn't make sense to design something

that can't be adjusted. Or is that just a parameter because of the limitations of the crew?

Mr. NELSON. I think the crew limitations probably is the most important thing.

Mr. DEFAZIO. I have never been a big fan of two crew over water sorts of things, but we are stuck with it.

The issue of the 777 was raised earlier. What standard is that being designed to?

Mr. NELSON. I am glad you asked that because I would like to straighten that out.

Mr. DEFAZIO. I don't think there was an answer. He talked about the compression ratios or whatever.

Mr. NELSON. Which we tend to get larger as we go along. As far as specifying what the nominal conditions should be, the 777 in actuality, even though the engines are taxed even more heavily in order to provide bleed air, has been designed to provide the desired fresh air at the door limit.

I am saying the previous design approach would be to take the average passenger load or maybe the average tourist passenger load, put your design point there.

It is a little less conservative. Maybe that means an airplane with 350 passengers that you could actually legally put maybe 375 passengers in and still meet all the evacuation requirements. We have gone ahead and considered the full, as many people as you can put in there and made that our design point, so that makes it slightly better.

The other thing we have done, even though back in the early 1980s when the recirculation systems first came into being, we did not only follow the FAA requirements. We took a good look at the OSHA requirements. We also took a look at where ASHRAE was going, and we elected to beat their at-that-time standard of 2500 parts per million of CO_2. This coincided with a little less than 10 cubic feet per minute, if you go down to seven or eight. What we actually achieved was about 11, 12, 1,300 parts per million, which we thought was well below the ASHRAE standard.

Then the ASHRAE lowered the standard, and they did it in part because of the uncontrolled conditions in buildings. They knew if you ventilated enough to keep the CO_2 down to a thousand parts per million, you are probably going to pick up all these point source things you couldn't control. Our position is on an aircraft you can control those point sources a little bit better.

The other thing is the filtration. We started out saying we wanted the equivalent to hospital filters. We have actually gone beyond that. We have gone from a 90 percent to a 94 percent now to a 99 percent efficient filter at these small particle sizes we have talked about today.

So within the constraints we have, we continually try to improve things, all within the basic operating parameters and the economic parameters of the new engine systems.

Mr. DEFAZIO. You mentioned point sources; you say you could control them a little better. We had that expressed by a previous panel. So you feel there are some improvements we could be making in that area?

Mr. NELSON. As far as the airplane materials and construction, we have that controlled pretty well. We have heard testimony that unique incidental and transient type of things can get into the airplane through various means and cause serious problems.

Mr. DEFAZIO. You just raised one other point in answering the question, which I appreciate, which is that you used an average capacity in the past, but when you create one of these cattle car situations, which goes to a point Mr. Robeson, is dear to my heart, which is we should have a seat pitch standard. I asked the FAA about that and they told me they have one, and finally they admitted they didn't have one. As many seats as you can cram in and still have evacuation standards, you can cram in. I agree with you that it is a real problem.

But you are telling me that in the case of some of these cattle car situations, where you just cram the seats in, some of these foreign airlines in particular, that actually because of the number of people on board you are not getting the average in terms of the CFS. You are getting a lower average because you have more people than anticipated.

Thank you.

Thank you, Mr. Chairman.

Mr. ROBESON. Mr. Chairman, may I make one correction?

When I talked about, sort of jokingly, the seat pitch, actually my goal is a bed, but that is a goal, that is not a standard. And the reason we make that distinction is because that goal, as TWA has recognized, is a competitive issue. As long as you can evacuate the plane safely, that is a standard.

Mr. DEFAZIO. Right.

Mr. ROBESON. I just want to be clear on what I was suggesting.

Mr. OBERSTAR. Evacuating the plane safely is the subject of a very long hearing. I would rather you didn't bring that up right now, because you might get beat up on the subject.

I understand that Delta, am I correct, Mr. Landry, has inaugurated a flight from Atlanta to Hawaii which is somewhat longer than six hours and has no smoking on board?

Mr. LANDRY. I think that is quite possible. There is a lot of marketing experimentation going on in various parts of the world. That doesn't surprise me. I am not familiar with that particular flight. It doesn't surprise me.

Mr. OBERSTAR. At least the information, I haven't been able to verify it, since this hearing—this afternoon, when we reconvened the hearing, the information came it my attention, that this flight was matched by a competitor, American.

That is a good sign. And it is the kind of thing we like to see happen.

Mr. LANDRY. I think one of the problem areas in the world, frankly, still, is in Japan, there is a heavy amount of smoking culture, so to speak, and I know that a New York Times article I read indicated that Canadian Airlines International had received a one-year exemption from the Canadian government ban on any flights originating in Canada allowing smoking—a ban on all smoking, and that apparently the basis, according to the New York Times article, was that 75 percent of the traffic on that Vancouver–Tokyo route was of Japanese origin, and 60 percent of those people want-

ed to smoke. And that I guess was the problem that resulted in a one-year delay.

Mr. OBERSTAR. Following that, do you know of any other countries who regulate smoking aboard aircraft as the United States does?

Mr. LANDRY. Certainly Canada does. Certainly very strongly, and, I believe Jamaica does, and I gather that we are making much headway with Australia and New Zealand, in these multilateral talks, if you will, that have the same philosophy and policy and culture, everything.

Mr. OBERSTAR. Do you favor that approach, as sort of a regional or grouping of competitor countries to achieve mutual agreement on no smoking on international flights?

Mr. LANDRY. I think you know, Mr. Chairman, that I fall in the same camp as I believe you do, that in the best of all worlds I would love to say to ICAO, get universal treatment of this by all nations. But for ICAO, I think you would agree this is a strong resolution, it is stronger language than usual, the one that they produced in the 29th assembly in October of 1992. It says we urge all governments to prohibit all smoking by July 1, 1996. That is a leap of faith to get there right now, I must confess, but I think it helps considerably for our government to take the lead and negotiate with governments such as Australia and New Zealand, Jamaica, Canada, and so forth.

Mr. OBERSTAR. The United States should really be the driving force, the driving policy on this issue. After all, we carry half of all the world's passengers here in the United States.

Mr. LANDRY. That is true, and as I guess Mr. DeFazio was implying, we also pay 25 percent of the budget of most of these United Nations organizations.

Mr. OBERSTAR. Let me ask whoever wants to take on the technical question of whether you are aware of low-cost, low-tech monitoring systems to detect such elements as carbon monoxide, carbon dioxide?

In response to a question there was an earlier panel recommendation that there ought to be more careful monitoring and more testing be undertaken, and I think your own feeling is that you would like that to be done before you take regulatory action. But are there some low-cost, low-tech systems available.

Mr. LANDRY. Could I ask Dr. Janczewski, our resident scientist.

Ms. JANCZEWSKI. I think you have to define low-cost. I think what you get with truly low-cost, low-tech data election is just that, low-cost, low-tech data. If garbage comes in, garbage is going to come out.

The problem with doing this kind of testing is that it is very labor intensive. The equipment has to be carefully calibrated, watched, it is sensitive equipment, you can't bang it around the field too much. We have a CO_2 monitor in the room that has been monitoring the air in here all day. We have to be careful with the equipment.

So depending on what your idea of low cost is, an average monitor is going to cost you around $5,000, and all the associated that goes with it. And that is giving you—that is, for instance, not monitor you have here. So that can be a relatively expensive venture.

Now, if there is a large market for it, where if you want to install it on board aircraft, as long as the market is driving it I suppose somebody will come out and scale it down and make it more cost effective.

Mr. LANDRY. I think you missed, Mr. Chairman, you were out during the moment of my testimony when I referred to my own home, and our monitoring here indicates that this room is just about as bad as my home, where I have a wife, two children, two dogs and a cat, and most of the neighborhood kids coming in and out with dust and germs. It is bad at home, but it is pretty bad here.

Ms. JANCZEWSKI. The CO_2 levels we are experiencing through this room and have been throughout the day are not any different than what we see on board the airline cabin. The point being CO_2 at those levels are not producing a health problem. They are certainly an indication, but that there are a lot of people crowded into a space together.

Mr. OBERSTAR. Lest we scare any more Members away, we won't ask you to reveal those numbers. But for your information, the air that comes into this building is electrostatically precipitated before it enters the system, and washed and scrubbed and then circulated. I observed the system many years ago when it was installed. It is very fascinating. But still you are saying that notwithstanding that, you have high levels of——

Ms. JANCZEWSKI. Electrostatic precipitators can generate ozone. You have to be careful about that, too.

Mr. OBERSTAR. That is interesting.

For Boeing and Douglas, what do your engineers recommend as ideal moisture percentage aboard wide bodies and narrow bodies?

Mr. NAGLE. From the Douglas standpoint, we try to stay between 10 and 20 percent. We do that because of the rapid accumulation of moisture. Every inch of skin on the aircraft is at approximately minus 60 degrees on the inside. That immediately condenses the moisture. The moisture doesn't dry. It freezes on these skins. Then it condenses. As dry an environment as possible is best for the aircraft, from a corrosion standpoint.

Like Mr. Robeson stated, our requirement, our first requirement is safety. And we have to take into consideration the corrosion impacts of moisture, the ice accumulation. Ice accumulation can possibly cause safety considerations, ice accumulation in the control system, driving devices, any areas where we don't want the moisture, the condensation to freeze.

Currently, a lot of operators are running desiccant devices, drying devices for when the aircraft are on the ground, on overnights, because moisture is building up in the installation blankets. This moisture is, like we said earlier, a breeding ground for bacteria. So everything that we want to do tends to keep this down to a low level.

We definitely don't want to see moisture higher than we have to have it in the airplane. Ten percent, 10 and 20 percent looks like what we run normally in the aircraft.

Mr. OBERSTAR. Mr. Nelson.

Mr. NELSON. Yes, I believe Mr. Halfpenny actually recounted some experience we have had. We were asked to put some humidi-

fication in for crew rest areas and for the flight deck areas in one or two airlines. And our goal was to get the humidity up to about 30 percent. We thought that theoretically could be possible in a small area. I think it was mentioned that around 22 percent, when we started to get drippage problems, and the technology of the device, we tried to add water as vapor into the air, when we started up the tank of water, we had all kinds of problems. Sometimes it went into the air as a mist, which immediately condensed out and dripped on people. Other times the system itself accumulated water, was stagnant and so forth.

One of the research areas we continue to look at, there may be some technology that will come along some day to make it possible. On the other hand, we never thought of trying to humidify an airplane carrying 400 or 500 people. Putting that water throughout the entire aircraft would be less than desirable.

Mr. OBERSTAR. Are there conditions under which you have detected mold developing? I heard discussion of mold. Has that been a recorded phenomenon?

Mr. NAGLE. Significant amounts of moisture in the insulation blankets, I don't know that anybody has really investigated this moisture to find if mold is there, but we have a lot of airplanes in the Far East where they have the rainy seasons, that the humidity levels are so high, and the systems just accumulate enough moisture and the people bring in enough moisture with them that that moves into the airplane and condenses on the skin, and the skins where the insulation blankets are on the outside.

And it is always—like we said, that 10 to 20 percent relative humidity is not unlike what you would find in a cold environment here in Washington in the winter, where it is very cold, and you find yourself getting shocked every time you touch something metal on the wall, or in the Southwest, Tucson, Phoenix areas.

So it really is not an unhealthy environment, let's face it. People get sent to Tucson for their respiratory illnesses. In fact, that does not in itself cause a problem. But if you are acclimated to a moist environment and 20 minutes later you are in an 8,000-foot airplane at 10 percent relative humidity, you should do something to accommodate that. That is where we recommend juices, moisturizing creams, eye drops if you wear contacts, things like that so that the passenger is not experiencing discomfort.

And many of the symptoms associated with dehydration at altitude are similar to those that have been mentioned in many of the areas where people have not felt well. Also, it is recommended to stay off of alcoholic beverages and coffee, any caffeinated drinks prior to and during flight, to accommodate that dehydration.

Mr. OBERSTAR. Earlier there were some numbers, cost figures given about costs of operating the outside air filtration packs at various levels. Do you have any disagreement with those figures?

Mr. NAGLE. Do you mean going to the 100 percent——

Mr. OBERSTAR. Yes.

Mr. NAGLE. Earlier I stated what had we estimated the ticket price would be, and that is significantly different than some of the estimates that were given earlier.

Mr. OBERSTAR. You think the costs are higher?

Mr. NAGLE. Significantly, yes, sir.

Mr. OBERSTAR. Okay.

Mr. LANDRY. I think, Mr. Chairman, if I might add, I think one should also look at the downside of 100 percent fresh air at altitude, the irritation, discomfort, as I mentioned, the soft contact lenses, the scratchy throats, everything else.

Ms. JANCZEWSKI. If I could comment on that, Mr. Chairman, it is important to understand that if you don't have a health concern, if your CO_2 levels are acceptable, you don't have what you consider to be a health problem, then you don't need to bring in more fresh air, because you don't know what the effects are down the line with the other environmental parameters.

You have to be careful before you just arbitrarily make that decision of let's bring in more fresh air. Maybe that will take care of it. Because maybe it won't. Maybe it will create additional problems. Maybe the fact that you are now bringing in dry air, you are dropping the humidity, maybe that would be a problem.

Getting back to, if it is not broke, be careful what we are going to fix first. So I would just caution you, if you just bring in fresh air, that will alleviate it, because we just don't know.

Mr. OBERSTAR. Are you suggesting by that, that there be more monitoring, testing of that——

Ms. JANCZEWSKI. Absolutely. Absolutely. I think we discussed that earlier when you were out of the room.

Mr. OBERSTAR. There is a cabin air quality task force that is working on some of these issues? You are participating in this?

Mr. LANDRY. ATA, AIA and ASHRAE are.

Mr. NAGLE. ASHRAE will have their first meeting of the ASHRAE-sponsored organization in June. At the major ASHRAE convention they have at the end of the June, this will be the first time ASHRAE will accept a full responsibility to establish cabin air quality standards.

Mr. OBERSTAR. Are cabin crew participating in this, pilots, flight attendants, all have been invited to this? And when will the meeting be?

Mr. NAGLE. The presentation forum is on the 28th, and there will be presentations on early—on the 28th, at 8:00 the presentations start, and at 10:00 the forum starts.

Mr. OBERSTAR. Be sure you notify our committee. I think we would like to have——

Mr. NAGLE. Yes, sir, I can make that part of the minutes, if you like.

Mr. LANDRY. I was just told by Mr. Rioux, it is an open meeting, so if any of those parties have not been invited, they are welcome.

Mr. OBERSTAR. We look forward to the results and to the ongoing work that you are engaged in.

I have heard, prior to this hearing and today we were told by, I believe, a witness that future model aircraft will use more and more recycled air, and—you are going to 100 percent recycled air.

Mr. NAGLE. No, sir, you can never get 100 percent recycled air. You have to maintain cabin pressure. You have to draw in outside air to pump into the cabin to allow for normal leakage in the cabin and to allow for control of the cabin pressure. So you never get a point where you have 100 percent recycled air.

The airplane, our MD–11, which is the newest airplane we have flying, in service, is a little over 50 percent fresh air, slightly less than 50 percent recycled air. On our MD–90 we are about 37 percent recycled air. Our MD–95, which we are proposing at 100 percent fresh air, because it doesn't require a recirculation system, it is smaller.

Mr. OBERSTAR. Mr. Nelson, do you have anything to add?

Mr. NELSON. I agree with that. I think it was previous testimony that said we need at least two and a half per cubic feet minute or so just to pressurize the airplane. We are pretty comfortable with the 10 right now. The engine manufacturers keep putting pressure on us. We are looking at other ways to get the air other than to take it out of the engine.

We are looking at electrically driven compressors. We do have R&D work going on. We still have not found a way more efficient than the way we are doing it now. We have to again balance the total engine design parameters—we call it the secondary power systems—to extract power from that system and make it all work together.

Mr. OBERSTAR. I will give you the opportunity to answer a question that has been raised again and again.

Is there less air circulating on nonsmoking flights than there was on smoking flights?

Mr. NAGLE. No, sir. The elimination of smoking made no changes to the design. There was no design consideration made at that time to change it.

Actually, the advent of the recirculation systems was in the 1979–1978 time frame, and that kind of started recirculation, and it hasn't been——

Mr. OBERSTAR. So on a same-type model aircraft prior to the smoking ban, after the smoking ban, there is no difference in volume of air, amount of outside air?

Mr. NAGLE. No, sir. Same system.

Mr. OBERSTAR. All right. I just wanted to give you that opportunity.

We have a recorded vote in progress.

This panel has, I think, responded fully and thoroughly to all of the questions that we had. We greatly appreciate your presentation. Thank you for being with us today.

Mr. LANDRY. Thank you, Mr. Chairman.

Mr. OBERSTAR. We have one more panel and we will convene that panel as soon as we return from this vote.

[Recess.]

Mr. CLINGER [presiding]. The subcommittee will reconvene. We will call up our final panel consisting of Mr. John Banzhaf, Action on Smoking and Health; and Mr. John White, Coalition on Smoking or Health. Mr. Oberstar is en route back from the vote, but in the interests of expediting the hearing, he asked me to get started, and I guess we will.

TESTIMONY OF JOHN F. BANZHAF III, PROFESSOR OF LAW, GEORGETOWN UNIVERSITY, AND EXECUTIVE DIRECTOR, ACTION ON SMOKING AND HEALTH; DR. JOHN WHITE, PAST PRESIDENT, AMERICAN LUNG ASSOCIATION, ON BEHALF OF THE AMERICAN LUNG ASSOCIATION, AMERICAN HEART ASSOCIATION, AND AMERICAN CANCER SOCIETY, PARTNERS IN THE COALITION ON SMOKING OR HEALTH

Mr. CLINGER. And we will ask Dr. White to lead off, if you would, Dr. White.

Dr. WHITE. Thank you. Mr. Chairman, I am Dr. John White, Past President of the American Lung Association. I am speaking today on behalf of the American Lung Association and its partners in the Coalition on Smoking or Health, the American Heart Association and the American Cancer Society. I might mention that this coalition co-chairs, with the Canadian Cancer Society, the Campaign for Smokefree Skies Worldwide, and this organization has 60 members.

If I might digress, Mr. Oberstar wondered—what is the status of smokefree flights. The last three pages of our statement includes a listing smoking restrictions on a range of airlines in the world.

The Coalition wishes to commend the House Subcommittee on Aviation for its consideration of airline cabin air quality, particularly for international flights. We appreciate having the opportunity to address smoking-related problems frequently experienced during international air travel. The health, well-being and comfort of hundreds of thousands of airline passengers are jeopardized by cigarette smoking on international flights.

Although most airline passengers are primarily affected by the acute irritating affects of environmental tobacco smoke, some individuals are unable to travel by air because their reactions to environmental tobacco smoke are life-threatening. With flight attendants, for whom this exposure is a regular occupational hazard, the problem as they have emphasized in their comments today, can be very serious. Nose and throat irritation, headaches, dizziness and nausea caused by the heavy concentration of tobacco smoke found in smoking sections of the passenger cabin and the recirculation of polluted air throughout the entire cabin are an unhealthy fact of life for too many flight attendants—I might say for all flight attendants.

The exposure of nonsmokers to environmental tobacco smoke poses definite health risks. Many of these are highlighted in our written statement.

The Coalition on Smoking or Health would like to point out that it is reasonable to anticipate that the adverse health effects of exposure to environmental tobacco smoke would be the same in airline cabins as it is in other limited or indoor structures. Risks of lung cancer, cardiovascular disease, and increased respiratory illness can be expected after a prolonged exposure to tobacco smoke in airplanes.

In addition, the confined structure of an aircraft passenger cabin poses particular problems with respect to air quality. The low humidity and the unusual constraints in air circulation within the passenger cabin exacerbates smoking-related symptoms experienced by the nonsmoker.

A dry atmosphere intensifies the irritation of the mucous membranes lining the sinuses and upper respiratory system. This effect is particularly pronounced for persons with allergies, respiratory infections and chronic lung disease.

At the triennial assembly meeting in 1992, representatives of 168 nations to the International Civil Aviation Organization voted to prohibit smoking on all international airline passenger flights and did so not only out of the concern for the impact of passive smoke on human health, but also due to their concern for passenger safety. The resolution, cosponsored by the countries of Australia, Canada, Pakistan, the Russian Federation and the United States calls for all ICAO member states to phase out smoking on international flights no later than July 1, 1996.

The agreement also requests ICAO to establish standards which nations can use to achieve the goals of the resolution.

The Coalition on Smoking or Health was very pleased that the United States Government was one of the sponsors of the ICAO resolution. However, we remain concerned about the speed with which our government is moving in regard to meeting the resolution's stated objective. Beyond discussion of a few bilateral and multilateral agreements, none of which has been completed, the Coalition has seen no action to date taken by the Department of Transportation to ensure that U.S. carriers and foreign flag carriers will be in compliance with the resolution by the stated deadline.

The Coalition urges the subcommittee to seek clarification from the Department regarding its planning for implementation of the ICAO resolution.

The U.S. has shown tremendous leadership with regard to smoking restrictions on domestic flights. Please know that we stand ready to assist the subcommittee should you opt to move this effort a step further.

Thank you for this opportunity to comment today, and I will be happy to try and respond to any questions you may have.

Mr. CLINGER [presiding]. Thank you very much, Dr. White, for very helpful testimony.

Do I understand that you are on a very tight timetable here?

Mr. WHITE. Yes, sir. I live in the neighborhood—I live in Maryland, and I have to be back in Frederick at an early time.

Mr. CLINGER. Well, if I may just ask you one question and then I think we can release your bondage here. You have spent a long afternoon waiting.

Mr. WHITE. I feel guilty, because I know many people have suffered a long day.

Mr. CLINGER. We appreciate your willingness to wait. But we have heard testimony today that even smokers really sometimes prefer nonsmoking flights; that they have indicated on international flights that they would almost prefer to have a nonsmoking flight because otherwise they would be inclined to smoke, and they don't like to smoke on airplanes where there is very dry air and so forth.

And now a lot of the airlines are experimenting with phasing in nonsmoking flights. In view of these kind of developments, do you

think that maybe it is unnecessary for a government to act; or do you think that it will not take place unless government acts?

Mr. WHITE. I am afraid that inertia would rule and unless there is some prodding, governments around the world will not act. Currently there is piecemeal action, as you can see from the attachment to my testimony, that there are only one or two flights from selected locations in the United States, for the American flag carriers, that have offered smoke-free flights to major airports in Asia or Europe.

The coalition believes that all governments must act on the ICAO resolution, this provides consistent protection to passengers as well as the crew and "levels the playing field" for all carriers. We encourage the U.S. government to take leadership and urge this subcommittee to do likewise.

Mr. CLINGER. Mr. Oberstar may have some questions to submit to you for the record if you would be willing to answer them for the record.

Mr. WHITE. Yes, sir.

Mr. CLINGER. But in any event, I will let you get on your way, and we will turn to Mr. Banzhaf.

Mr. WHITE. Thank you very much. I appreciate your kindness.

Mr. CLINGER. Thank you very much.

Mr. Banzhaf, we will hear from you now.

Mr. BANZHAF. Thank you very much. My name is John Banzhaf, and I am testifying on behalf of Action on Smoking and Health, which is a different organization from the Coalition on Smoking or Health. I am also the attorney who in 1968 took the first major action against the polluted in-flight air by bringing a legal action which eventually led to no smoking sections on airplanes; and some five lawsuits, 100 legal actions, various complaints and so on later, strengthened the protections for nonsmokers and led to the eventual ban on smoking on domestic flights.

In addition, since it was mentioned earlier today, it was my organization that filed the lawsuit which eventually forced the Occupational Safety and Health Administration to issue its notice of proposed rule-making which would deal both with environmental tobacco smoke and general indoor air quality. That has been referred to several times here today.

My purpose today is to advise you of what may well be, along with the risks posed by environmental tobacco smoke to flight attendants, the most dangerous single health problem from polluted air existing on airlines today. And unlike every other problem that you have heard this afternoon, it is the one that does not require any further study, it does not require any further measurements, and it can be cured at absolutely zero cost, no trade-offs.

I am here on behalf of the millions of tragic and tiny and utterly defenseless victims who are seeking your help, because today the airlines are requiring them to be seated in the smoking section on airplanes. We are going to respectfully request your assistance in solving that problem—young children being seated in the smoking section on airplanes—either by pressuring the airlines themselves or the agency responsible for regulating them, or if necessary, by passing new legislation.

The problem, Mr. Chairman, is that young children, toddlers, infants, are routinely seated in the smoking section on airplanes where smoking is still permitted, where they are subjected to enormous concentrations of tobacco smoke—in some cases, more than 30 times higher than they would in a normal environment, here in a smoking section; far higher than most adults would ever be subjected to.

Furthermore, this exposure on international flights occurs for much longer periods of time, six to twelve hours is not unusual. Therefore, it is longer than they would get virtually anywhere else.

Then there are two other factors. One is, we have much lower air pressure, pressurization normally to 8,000 feet which means much less oxygen available should the children go into respiratory distress, and you have the natural fears and reactions of children to flying which can intensify any kind of reaction.

From all of this, Mr. Chairman, it happens—it often happens that when children are exposed to tobacco smoke, they suffer respiratory distress. Respiratory distress can be life-threatening. The EPA calculates that many children suffer respiratory distress—up to one million—one million asthmatic attacks every year simply from the level of tobacco smoke you would find in a home where one parent smokes. But at least where that happens, the parent can call an ambulance, the child can be rushed to a hospital and given literally lifesaving treatment.

Where the same child is exposed to smoke on an airplane—again, concentration 10, 20, 30 times higher than they have in the home, and if that pushes them into respiratory distress—there is no ambulance which can reach that child at 30,000 feet, no emergency medical care.

In view of the EPA report, Mr. Chairman, we now recognize that there is a very grave danger to secondhand tobacco smoke, particularly for young children. So in a growing number of areas, society is taking the steps necessary to protect them, even where their parents do not appreciate those dangers, or even where the parents are negligent in protecting the children.

For example, this body passed and the President has signed a bill limiting smoking in schools. Just last week a subcommittee of this body passed legislation to protect children from much lower concentrations in shopping malls and in bowling alleys. McDonald's and many other fast food outlets have banned smoking entirely to protect children, and at least 12 States have ruled that children can be taken away from their parents if the parents subject them to secondhand smoke.

How ironic, how illogical is it that in view of all we know today and all that these businesses are already doing, airlines routinely seat children in the smoking section on these long international flights?

Action on Smoking and Health sent a letter to each and every international carrier advising—putting them on legal notice of the dangers that secondhand smoke poses to children and asking them not to seat the children there, and not one has had either the courtesy to respond or to change their current practice. This goes on. Their justification is simply that is what the parents or the guardians or the adult traveling with them want.

But we routinely prohibit parents from bringing children into many areas where they could be adversely affected—places where gambling goes on, places where alcoholic beverages are served, even though the child may be three months old and obviously is not going to be affected. We keep them out of movies that may be harmful to them; we keep them from rides on amusement parks which may be dangerous to them, even—again, over the wishes of their parents.

I would respectfully submit that we can do no less, when the risk to children here is far greater and even more immediate. We therefore would urge the subcommittee to write to each of these airlines asking them to immediately voluntarily adopt the policy of not seating young children in the smoking section. After all, parents may be seated in the nonsmoking section with their children; they can refrain from smoking for an hour or two. When the craving or urge moves them, they can go to the smoking section, take a few quick puffs. But the children seated in the smoking section today have no such remedy. They cannot refrain from breathing for an hour or two, and then go forward into the nonsmoking section to get a little bit of relief.

If the carriers refuse to respond to this subcommittee's request, we would strongly urge the Chairman and the committee to ask the Department of Transportation to use its authority to make this a rule, and if possible, to do this on an emergency basis. If that fails, we think legislation would be appropriate.

Now, we have all heard about this ban on smoking passed by the ICAO. Well, this might solve the problem, but certainly not until 1996 and perhaps not even then, or at least until Congress summons up the courage to ban smoking on international flights. But this problem, which we know exists—and anybody who flies on an international flight has only to look in the smoking section and see those infants and toddlers surrounded by volumes of tobacco smoke that would make you and me sick—and we are adults—subjected to this for six or eight hours where, if they suffer respiratory distress, there is no chance to take them to a hospital, we think this is a problem which simply cannot wait.

And unlike all of the others that I heard this afternoon, this is one that does not require additional study. This is one that does not require trade-offs. This is one that can be done immediately. It can be done without retrofitting and at zero—zero cost.

Finally, let me mention a very interesting point which I think the subcommittee and many of the witnesses may have overlooked, and this deals with the more general problem of ventilation in the airplanes. There is a current regulation on the books which already deals with this; 14 CFR 252.9, relating to ventilation systems in smoking, says and I quote, "U.S. air carriers shall prohibit smoking wherever a ventilating system is not fully functioning." "Fully functioning" for this purpose means operating so as to provide the level and quality of ventilation specified and designed by the manufacturer for the number of persons currently in the passenger compartment.

We have heard testimony this afternoon from Mr. Nelson of Boeing, who testified—and I checked with him later—that every air-

craft now flying, the manufacturer's instructions are that all of the vent packs should be fully operating, set in the normal position.

So although I didn't come in to testify on this, it would appear to me that on any international flight—that is, any flight where smoking is permitted—they must, by law, fully operate all ventilation packs, which is the Boeing recommendation. A violation of that leads to a $1,000 fine, and as the organization which has already filed complaints which have led to over $100,000 in fines under the general smoking sections, we would be happy to file or to assist in filing complaints against any air carrier on an international flight which dares to operate with its ventilating system not fully functional.

So in a sense, the two problems, the problem of smoking, the problem of ventilation, may very well come together; but once again, Mr. Chairman, since you had to step out, I would very strongly urge you, on behalf of the subcommittee, to write immediately to all of our carriers and urge them, for God's sake, to adopt a policy so that young children are no longer seated in the smoking section on airplanes.

Thank you, sir.

Mr. OBERSTAR. [presiding]. Certainly passengers can request that they are not seated—passengers with small children.

Mr. BANZHAF. Passengers who are over 18, but any passenger who is younger than that is going to be seated according to the wishes of the parent, guardian or adult traveling with them, and certainly children of 18 months or two years or five years can't make any independent request to be seated in the nonsmoking section.

Mr. OBERSTAR. Parents can—are you saying that they are often seated against their will in such——

Mr. BANZHAF. No. I am saying that the parents either are not aware of the risks or are willing to subject their children to it; and I pointed out that there are many situations where we do not allow this to happen with parents, that we are now at the point where 12 different States have said, parents who deliberately subject their children to serious concentrations of tobacco smoke can even lose custody.

So I am asking no more than what we do right now where alcoholic beverages are served, gambling goes on, X-rated movies and other things where we keep the children out, despite the wishes of their parents.

Mr. OBERSTAR. Thank you.

Mr. Clinger.

Mr. CLINGER. Thank you, Mr. Chairman.

And Mr. Banzhaf, thank you for your testimony. Just a couple of questions with regard to this issue about seating children in the nonsmoking section.

I am advised that in June—in our June 1989 hearing on smoking, your testimony at that time indicated that, quote, "Passengers seated in the nonsmoking section are inhaling virtually as many of the carcinogens and toxins as passengers seated in the smoking section."

If that is true, is it really going to do any good to put children in the nonsmoking section? I mean, if in fact what you said then

in 1989 was that it really doesn't make much difference if you are on a plane where there is smoking, you are exposed to the danger whether you are in the smoking or nonsmoking section.

I want to get to the core of the problem.

Mr. BANZHAF. I will give you two answers. Number one is, I think—I don't recall directly that testimony, but it is related to the many, much smaller planes which were then flying the domestic routes where the separation is far less than it is on your larger planes which are flying on the international routes.

Second, the last time you flew, was there a difference in the concentrations of tobacco smoke when you walked into the smoking section and when you were in the nonsmoking section? I think the answer to that is obvious and the answer is, yes, there are differences—children.

Mr. CLINGER. You are certainly more aware of the fact that there is smoke there, but if the carcinogens are invisible and if they, in fact, permeate the entire cabin, it would seem to me that you might have an equal risk.

Mr. BANZHAF. Actually, sir, in this case, I think we are not talking so much about the carcinogens, which are very serious and can literally double a child's risk of getting cancer later in life; we are talking about the irritants which are more likely to provoke an immediate respiratory attack.

Mr. CLINGER. All right. I think the objective of your organization would be to get rid of smoking on international flights altogether.

Mr. BANZHAF. Certainly.

Mr. CLINGER. I would think that that is the ultimate goal.

Mr. BANZHAF. Certainly.

Mr. CLINGER. Should we mandate nonsmoking foreign flights at the government level even if we are unable to get foreign airlines to do the same? In other words, if there is foot dragging and, for whatever reason, we find that the foreign airlines with which we have negotiated an agreement, don't ban smoking are we putting our carriers at a terrible disadvantage if we insist that they go ahead and, ban smoking regardless of whether the foreign airlines are doing the same?

Mr. BANZHAF. First, I think we should, sir, because it is not a matter of choice; in my judgment, it is not a matter of where we allow consumer preferences to apply. The government should not mandate whether airlines serve steak or chicken. The airlines should mandate basic safety and health requirements.

So in the same way that we may require that smoking be restricted, we also require, for example, certain safety. We don't let airlines compete on whether they are going to have two, three, or four rafts or a first aid kit and so on.

Second, at least since the mid- and late-1970s, when these regulations kicked in, our carriers have been under obligations related to smoking which do not apply to all other carriers. Right now, if I got on any other carrier, SwissAir, Lufthansa, Air Italian, flying across the ocean and they suddenly decide, as has happened, that they want to seat 50 smokers in the nonsmoking section, there is nothing in the world that I can do about it.

American carriers cannot do that, and long before we had the first amount of evidence that secondhand smoke caused cancer in

nonsmokers, we were requiring our carriers to—even flying, say, from Japan to certain other routes in that area, to have no smoking sections, to enforce nonsmoking sections, to expand the nonsmoking section as necessary to protect passengers. And I think the feeling, the theory and the philosophy is, the health of passengers comes ahead of mere preferences.

Secondly, I am not sure——

Mr. CLINGER. Regardless of what it may do to the airline? I mean, if in fact the airline loses market share—although there is a real debate about whether they would, in fact, lose market share—but if they were to lose it——

Mr. BANZHAF. I think safety and health come ahead of profits, yes.

Mr. CLINGER. Okay.

Mr. BANZHAF. Second, although I have not finished the research on it, I am not sure but that the United States might have more power than it thinks. It is my understanding, for example, that all cruise ships which take off or land in the United States must observe certain standards with regard to the refrigeration and safety of food preparation while they are in international waters and even between two other countries. So it is not at all clear that the United States—which you have already mentioned in these hearings carries 50 percent of all passengers—could not unilaterally require the protection of people who leave for the United States or disembark in the United States, who would also be entitled to that protection.

And if that were so, we could very well eliminate this problem, place everybody on a completely level playing field, if we had the courage to push it. I hope we might.

Mr. CLINGER. You are saying that a foreign airline that was unwilling to prohibit smoking would be denied landing rights because of that?

Mr. BANZHAF. Carriers would be told, just as cruise ships are now that there are certain minimum standards of safety and health if they depart from or land on United States shores, yes.

Mr. CLINGER. We have a lot of studies of passive smoking and the harm that it does, but those studies have largely been with regard to chronic exposure to passive smoke in offices or homes. Now, obviously the people who are exposed on a chronic basis are flight attendants. But would the same argument apply to passengers who are not being exposed on a regular basis?

In other words, could you really use the same studies with regard to passengers on airlines that you could use with people who are frequenting office buildings where smoking is regular—where they are exposed to it on a regular basis?

Mr. BANZHAF. The second half of the EPA report specifically addressed, I believe, that issue—at least with regard to young children, which again is the subject of my testimony—and there, they were talking about temporary irritations, not chronic exposure.

Basically, what they found is temporary exposure of children to the level of tobacco smoke they would find in a home where only one parent smoked, which is much less than, say, on airplanes or someplace else, produces anywhere from 200,000 to 1 million asthmatic attacks every year, between 150,000 and 300,000 cases of

bronchitis, pneumonia and other serious respiratory problems—some 10-, I believe, to 25,000 of those requiring hospitalization—massive amounts of inner ear infection, and up to 26,000 new cases of asthma.

So certainly with regard to children, we are aware that even short exposures trigger this.

Finally, the one issue which I think has never been questioned—because we have the data, indeed we cited it back in 1969 in first getting separate sections on airplanes—it is undeniable that there are a large number of Americans, we estimate 30 to 40 million, who have asthma, sinusitis, hay fever, various allergies and so on, who are immediately, seriously affected by even short-term exposure to tobacco smoke.

I would say to you, you can go back to your home district, call any major hospital, any allergist, certainly any pediatrician, any ENT, ask them, do you have a patient who cannot go into a restaurant where there are smoking and no smoking sections? And they will tell you, yes, I have such patients. They cannot go there even if they stay away for a week or a month.

So very clearly, even short-duration exposures to levels of environmental tobacco smoke, which are all too common in our society, can trigger very serious allergic-type reactions in people, and particularly in children. And that is in addition to the chronic problems that many of the flight attendants testified to; that is, in addition to the lung cancer, which we are now certain is caused by secondhand tobacco smoke, and the heart attacks, which at least OSHA—the Maryland OSH and many of the health organizations believe are caused by secondhand smoke.

Mr. CLINGER. Thank you, sir.

Mr. BANZHAF. Thank you, sir.

Mr. OBERSTAR. Mr. Landry, would you mind coming back to the table and responding to a question, since you are still here in the audience?

Gene McCarthy told me that one of the worst things for a town meeting is that last question. You should also get—no, stay here, Mr. Banzhaf.

Mr. LANDRY. You are probably involved.

Mr. OBERSTAR. Mr. Banzhaf has raised the question of children on international flights and the information available to parents, and what I want to ask you is, is there any additional burden upon airlines to assigning parents with children on international flights where there is smoking to nonsmoking areas?

Do you see any—any procedural difficulty in assigning them, and informing parents that they have a right to be assigned to nonsmoking areas?

Mr. LANDRY. Well, I stayed here, Mr. Chairman, to see if the good professor had any new problems that I hadn't heard of, and—quite frankly, I had not heard of this particular experience that he has apparently documented.

I would like—if you don't mind, if I could submit something to the record. I am not familiar with the facts here, and I don't want to provide this committee with anything but facts.

Mr. OBERSTAR. Well, and policy of carriers, too.

Mr. LANDRY. Well, I like to suggest things of that nature, too, yes.

Mr. OBERSTAR. Well, I would like you to explore that.

Mr. LANDRY. Okay. I shall, and I will be back.

[The following was received from Mr. Landry:]

Air Transport Association

James E. Landry
President

June 10, 1994

Honorable James L. Oberstar
Chairman
Subcommittee on Aviation
Committee on Public Works and Transportation
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

At the close of the Aviation Subcommittee hearing on Cabin Air Quality on May 18, 1994, you asked me to return to the witness stand to respond to some questions raised by your final witness, John F. Banzhaf, III, of Action on Smoking and Health. In our brief dialogue, I offered to submit some facts for the record concerning airline practices in dealing with smoking and non-smoking passengers on international flights.

Attached is a copy of the pertinent regulation, Part 252 of the DOT's Economic Regulations, 14 CFR Ch. II §252. As you will see, the airlines are obliged to, and do provide, a sufficient number of seats in no-smoking sections, for each class of service, to accommodate all persons who wish to be seated there, as well as an expansion of no-smoking sections to meet passenger demand (§252.7). Passengers on our international flights routinely request seats in a smoking or non-smoking section according to their desires, and are accommodated. Cigars and pipes are prohibited on U.S. air carriers (§252.15), and our carriers have an obligation to take such action as is necessary to ensure that smoking by passengers or crew is not permitted in no-smoking sections or at other times or places where smoking is prohibited (§252.17).

Whether or not smoking parents choose to expose their children to second-hand smoke as they do in their more poorly ventilated homes and cars is a decision made by the individual parent. As was pointed out to Mr. Banzhaf, his basic desire is to have smoking banned. As we had pointed out in our direct testimony, the U.S. airline industry fully supports the efforts by the International Civil Aviation Organization to achieve a smoking ban that will lead to uniform worldwide guidelines and rules. In that

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Honorable James L. Oberstar
Page Two
June 10, 1994

regard, in response to one of your questions, I cited a one-year exemption from the Canadian government's smoking ban, granted to Canadian Airlines International because 75 percent of the traffic on its Vancouver-Tokyo route was of Japanese origin, and 60 percent of those people wanted to smoke.

I trust that this letter offers the facts desired for the record.

Respectfully submitted,

Jim Landry

James E. Landry
President

cations. Some airlines do not apply these consumer protections to travel from some foreign countries, although other consumer protections may be available. Check with your airline or your travel agent.

(b) Every carrier shall include with each ticket sold in the United States the notices set forth in paragraph (a) of this section, printed in at least 12-point type. The notice may be printed on a separate piece of paper, on the ticket stock, or on the ticket envelope. The last two sentences of the notice shall be printed in a type face contrasting with that of the rest of the notice.

(c) It shall be the responsibility of each carrier to ensure that travel agents authorized to sell air transportation for that carrier comply with the notice provisions of paragraphs (a) and (b) of this section.

(d) [Reserved]

(e) Any air carrier or foreign air carrier engaged in foreign air transportation that complies fully with this part for inbound traffic to the United States need not use the last two sentences of the notices required by paragraph (a) of this subsection.

(Approved by the Office of Management and Budget under control number 3024-0016)

[ER-1308, 47 FR 52985, Nov. 24, 1982, as amended by ER-1392, 49 FR 40401, Oct. 16, 1984]

PART 252—SMOKING ABOARD AIRCRAFT

AUTHORITY: Secs. 204, 404, 407 and 416 of Pub. L. 85-726 and 101-164, as amended, 72 Stat. 743, 780, 766, 771, 49 U.S.C. 1324, 1374, 1377, 1386.

SOURCE: 55 FR 4993, Feb. 13, 1990, unless otherwise noted.

CROSS REFERENCE: For smoking rules of the Federal Aviation Administration, see 14 CFR 121.317(c), 121.571(a)(1)(i), 129.29, 135.117(a)(1), and 135.127(a).

§ 252.1 Purpose.

This part implements a ban on smoking of tobacco on flight segments between most U.S. points as required by section 335 of Public Law 101-164. It also continues smoking restrictions on other flights. Nothing in this regulation shall be deemed to require U.S. or foreign air carriers to permit the smoking of tobacco aboard aircraft.

§ 252.3 Applicability.

Section 252.5 applies to scheduled-service flight segments operated by U.S. and foreign direct air carriers between the U.S. points specified in that section. The remainder of this part applies to all operations of U.S. direct air carriers, except on-demand services of air taxi operators.

§ 252.5 Smoking ban on U.S. segments.

U.S. and foreign direct air carriers shall prohibit smoking in the passenger cabin and lavatories on any nonstop flight segment that is listed in the current *Official Airline Guide*, or is part of a longer flight that is listed in that publication, and that is:

(a) Between any two points within an area composed of Puerto Rico, the U.S. Virgin Island, the District of Columbia, and the 48 contiguous states of the United States;

(b) Between any two points within the State of Alaska or within the State of Hawaii; or

(c) Scheduled in the current *Official Airline Guide* to be six hours or less in duration and that is:

(1) Between any point in paragraph (a) of this section and any point in Alaska or Hawaii; or

(2) Between any point in Alaska and any point in Hawaii.

§ 252.7 No-smoking sections.

(a) Except as provided in paragraph (b) of this section, U.S. air carriers operating nonstop flight segments to which §§ 252.5 and 252.13 do not apply shall provide, at a minimum:

(1) A no-smoking section for each class of service;

(2) A sufficient number of seats in each no-smoking section to accommodate all persons in that class of service who wish to be seated there;

(3) Expansion of no-smoking sections to meet passenger demand; and

(4) Special provisions to ensure that if a no-smoking section is placed between smoking sections, the nonsmoking passengers are not unreasonably burdened.

(b) On flights for which passengers may make confirmed reservations and on which seats are assigned before boarding, a U.S. air carrier need not provide a seat in a no-smoking section to a passenger who has not met the carrier's requirements as to time and method of obtaining a seat on the flight, or who does not have a confirmed reservation. If a seat is available in the established no-smoking section, however, a U.S. air carrier shall seat there any enplaning passenger who so requests, regardless of boarding time or reservation status.

§ 252.9 Ventilation systems.

U.S. air carriers shall prohibit smoking whenever the ventilation system is not fully functioning. Fully functioning for this purpose means operating so as to provide the level and quality of ventilation specified and designed by the manufacturer for the number of persons currently in the passenger compartment.

§ 252.11 Aircraft on the ground.

U.S. air carriers shall prohibit smoking whenever the aircraft is on the ground.

§ 252.13 Small aircraft.

U.S. air carriers shall prohibit smoking on aircraft designed to have a passenger capacity of less than 30 seats.

NOTE.—This section, like the rest of this part, does not apply to on-demand services of air taxi operators; see § 252.3 in this part.

§ 252.15 Cigars and pipes.

U.S. air carriers shall prohibit the smoking of cigars and pipes aboard aircraft.

§ 252.17 Enforcement.

U.S. and foreign air carriers shall take such action as is necessary to ensure that smoking by passengers or

crew is not permitted in the passenger cabin or lavatories on no-smoking flight segments. U.S. air carriers shall take such action as is necessary to ensure that smoking by passengers or crew is not permitted in no-smoking sections or at other times or places where smoking is prohibited by this part, and to maintain required separation of passengers in smoking and no-smoking areas.

§ 252.19 Single-entity charters.

On single-entity charters operated pursuant to §§ 207.50 or 208.300 of this title, U.S. air carriers need not comply with the procedures of part 252 if such a request is made by the charterer, provided that each passenger on such flights is given notice of the smoking procedures for the flight at the time he or she first makes arrangements to take the flight.

PART 253—NOTICE OF TERMS OF CONTRACT OF CARRIAGE

AUTHORITY: Secs. 204, 403, 404, and 411, Pub. L. 85-726, as amended, 72 Stat. 743, 758, 760, 769; 49 U.S.C. 1324, 1373, 1374, 1381.

SOURCE: ER-1302, 47 FR 52134, Nov. 19, 1982, unless otherwise noted.

§ 253.1 Purpose.

The purpose of this rule is to set uniform disclosure requirements, which preempt any State requirements on the same subject, for terms incorporated by reference into contracts of carriage for scheduled service in interstate and overseas passenger air transportation.

§ 253.2 Applicability.

This rule applies to all scheduled direct air carrier operations in interstate and overseas air transportation. It applies to all contracts with passengers, for those operations, that incorporate terms by reference.

[ER-1323, 48 FR 6318, Feb. 11, 1983]

§ 253.3 Definitions.

Large aircraft means any aircraft designed to have a maximum passenger capacity of more than 60 seats.

Passenger means any person who purchases, or who contacts a ticket office or travel agent for the purpose of purchasing, or considering the purchase of, air transportation.

Ticket office means station, office, or other location where tickets are sold that is under the charge of a person employed exclusively by the carrier, or by it jointly with another person.

§ 253.4 Incorporation by reference in the contract of carriage.

(a) A ticket or other written instrument that embodies the contract of carriage may incorporate contract terms by reference (i.e., without stating their full text), and if it does so shall contain or be accompanied by notice to the passenger as required by this part. In addition to other remedies at law, an air carrier may not claim the benefit as against the passenger of, and the passenger shall not be bound by, any contract term incorporated by reference if notice of the term has not been provided to that passenger in accordance with this part.

(b) Each air carrier shall make the full text of each term that it incorporates by reference in a contract of carriage available for public inspection at each of its airport and city ticket offices.

(c) Each air carrier shall provide free of charge by mail or other delivery service to passengers, upon their request, a copy of the full text of its terms incorporated by reference in the contract. Each carrier shall keep available at all times, free of charge, at all locations where its tickets are sold within the United States information sufficient to enable passengers to order the full text of such terms.

(The notice requirements contained in paragraphs (b) and (c) were approved by the Office of Management and Budget under control number 3024-0061)

Mr. OBERSTAR. It would seem to me that with all of the experience that we had in the pre-prohibition on smoking days that airlines routinely assigned people to nonsmoking. In fact, they asked you outright, smoking or nonsmoking?

Mr. LANDRY. That is right.

Mr. OBERSTAR. And on international flights, it would seem to me that the same policy should apply, and that carriers ought to be made aware that there are families who have been assigned to smoking areas, families with young children, and that in the airlines—and that the airlines ought to adopt a policy of notifying families of the availability of nonsmoking areas.

Mr. LANDRY. Well, I had thought they were doing it, but I will certainly report back to the subcommittee. I thought that was the case.

Mr. BANZHAF. Mr. Chairman, I believe that is the case already, that the parents are aware of the availability, but many parents simply do not understand or appreciate just how harmful seating young children, particularly those with various problems, in the smoking section would be.

So the proposal would be not simply to advise them, but, respectfully, for the airline to say, we are sorry, we cannot seat you—we cannot seat somebody under the age of 15, for example, in the smoking section. And it seems to me there is a parallel for this over the last several years. Under FAA regulations, the airlines have not been able to——

Mr. OBERSTAR. The airlines voluntarily adopted that policy, and I would encourage your members to do that rather than for us to proceed with a rule-making.

Mr. LANDRY. I am aware of the exit row requirement that I believe Dr. Banzhaf is referring to. Of course, there is no regulation at this point. But I will certainly advise my members of this colloquy.

Mr. OBERSTAR. Very good. Thank you very much for responding. I appreciate it.

Mr. BANZHAF. Thank you, Mr. Chairman.

Mr. OBERSTAR. And thank you for your contribution, Mr. Banzhaf. It has been a splendid one.

We greatly appreciate the testimony of all witnesses today. It has been a most productive hearing, a good learning experience for all of us, I think, Members and witnesses alike. And there is much for us to meditate and deliberate, much for the Department to learn from this hearing today; and we will look forward to further documentation, and there may be some actions that the committee will wish to take to further the purposes of assuring a better quality life aboard aircraft for those who—for whom it is their work environment and for those who travel not only short but long distances as well.

The subcommittee stands adjourned.

[Whereupon, at 6:25 p.m., the subcommittee was adjourned.]

ASH

ACTION ON SMOKING AND HEALTH

2013 H St., N.W. • Washington D.C. 20006 • (202) 659-4310

Testimony of JOHN F. BANZHAF III
Professor of Law at the George Washington University and
Executive Director of ACTION ON SMOKING AND HEALTH (ASH),
a National Nonprofit Scientific and Educational Organization,
before the Subcommittee on Aviation, U.S. House of Representatives
on Wednesday, May 18, 1994 at 9:30 AM about
AIRLINER CABIN AIR QUALITY

As the attorney who in 1969 took the first major action against the problem of polluted in-flight air by bringing a legal action which required no-smoking sections, and who brought a series of over 100 law suits and other legal actions which gradually strengthened these protections for nonsmokers and led the way toward the eventual ban on smoking aboard domestic flights, I am honored to be invited to testify today.

My purpose this morning is to advise you of what may well be, along with the risks smoking sections pose to flight attendants who must work in them, the most dangerous health problem from polluted air existing on airlines today — and the one which can be most easily corrected, and at zero cost.

On behalf of the millions of tragic, tiny, and defenseless victims, we seek your assistance in solving it — either by pressuring the airlines themselves, or the agency responsible for regulating them, or by passing new legislation.

The problem is that young children are routinely seated in the smoking sections on non-domestic flights where they are subjected to enormous concentrations of tobacco smoke far higher than even non-smoking adults are likely to encounter in their everyday lives.[1]

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[1] For example, Figure 3-7 of the EPA report shows that, for residences, the normal range of nicotine concentrations is 2-11 $\mu g/m^3$, with a peak at 14 $\mu g/m^3$. [COPY ATTACHED]

In contrast, for transportation, the normal range extends to 47 $\mu g/m^3$ [about 7 times higher], while the peak concentration is 83 $\mu g/m^3$ [almost 7 times higher].

As another example consider Exhibit I. to the 1990 U.S. Department of Transportation Study of Airliner Cabin Air Quality. [COPY ATTACHED]

It shows that the average concentration of so-called respirable particles on no-smoking flights is about 37 $\mu g/m^3$, whereas the average in the smoking section is about 175 $\mu g/m^3$ [6 times

Furthermore, this exposure occurs for much longer periods of time than in almost any other situation.

These two factors, combined with the lower air pressure — and therefore less available oxygen — in the cabin, plus the natural fears and stresses of children related to flying — makes it far more likely that a child will suffer severe respiratory distress.

If this happens, as it does all too often even when children are exposed to the smoke of only one parent, there is no way the child can be rushed to a hospital for required emergency attention, as now occurs when this tragedy happens on the ground.

In view of the EPA's Report, we now recognize the very grave dangers secondhand smoke creates for young children.

Thus, in a growing number of areas, society is increasingly taking steps to protect them — even when their parents may not appreciate the dangers, or be negligent in protecting their own children.

For example:

- Last week a House subcommittee passed legislation designed to protect children from much lower concentrations of smoke found in places like shopping malls and bowling alleys.
- McDonald's, Arbys, ChuckECheese, Dairy Queen and other fast food outlets have banned all smoking, primarily to protect children.
- At least twelve states have ruled that courts may deny custody to a parent who smokes around a child, and in a few cases parents have actually lost custody for doing so.

How ironic, how illogical, how positively obscene, that in view of what we know today and what other businesses and governmental bodies are doing, airlines routinely seat even infants and toddlers in the smoking section on international flights.

ASH has sent to each carrier a letter warning airlines of the serious health hazards which occur when a child is seated in the smoking section on a non-domestic flight. [A COPY IS ATTACHED AND MADE A PART OF THIS TESTIMONY]

Yet, so far as we know, all continue the practice of assigning children seats in the smoking section — using, as a justification, the requests of their parents, guardians, or adult travel companions.

But we routinely prohibit parents from bringing children into many places where gambling or the consumption of alcoholic beverages occurs, and keep them out of movies and rides in amusement parks which are not suitable for them, even over the wishes of their parents.

We must do no less when the risk to children is far greater and even more immediate.

ASH therefore urges the Chairman to write on behalf of the subcommittee to each of the major carriers with international flights, asking them to immediately adopt a policy preventing children from being seated in the smoking section.

Parents who smoke may, after all, refrain from smoking while they are with their children in the no-smoking section, and simply step into the smoking section briefly if necessary to relieve their craving.

But their children have no such protection now — they cannot refrain from breathing while in the smoking section, and simply move into the no-smoking section periodically for a breath of cleaner air.

If any of the carriers refuse, we respectfully urge the Chairman to ask the Department of Transportation to use its authority to adopt such a rule — preferably on an emergency basis.

While the ban on all airline smoking adopted by the International Civil Aviation Organization (ICAO) will solve this problem, as well as those of flight attendants, and nonsmoking passengers subjected to drifting smoke, this relief may not come until 1996 — or until Congress summons up the courage to ban all smoking on carriers by statute.

But this problem — infants, toddlers, and young children forced for many hours to breathe concentrations of tobacco smoke which would cause serious health problems even for healthy nonsmoking adults — simply cannot wait.

This, the most dangerous single health problem from polluted air existing on airlines today, can be cured very easily at zero cost and with very little inconvenience — if only the subcommittee would use the force of moral suasion backed up by the threat of hearings and legislation.

Millions of young children — many of whom already suffer from asthma, hay fever, bronchitis, allergies, and inner ear infections — urgently need your help and protection now.

EXHIBIT 1. AVERAGE CONCENTRATIONS OF ETS CONTAMINANTS ON SMOKING AND NONSMOKING FLIGHTS

Parameter	Smoking Flights[1]				Nonsmoking Flights	
	Smoking Section	No-smoking Section				
		Boundary Rows	Middle Rows	Remote Rows	Rear Rows	Middle Rows
Particle-Phase Measurements						
Average RSP[2], $\mu g/m^3$	175.8	53.6	30.7	35.0	34.8	40.0
Peak RSP[3] (1 minute), $\mu g/m^3$	883.4	211.8	68.7	69.6		
Gas-Phase Measurements						
Average Nicotine, $\mu g/m^3$	13.43	0.26	0.04	0.05	0.00	0.08
Percent Nicotine Samples Below Minimum Detection	4.3	54.4	82.6	66.7	100.0	78.3
Average CO, ppm[4]	1.4	0.6	0.7	0.8	0.6	0.5
Peak CO (1 minute), ppm	3.4	1.4	1.7	1.6	1.3	0.9

[1] An average of 13.7 percent of the passengers were assigned to the coach smoking section on monitored smoking flights.

[2] Average of gravimetric and optical measurement results; micrograms per cubic meter ($\mu g/m^3$)

[3] Optical method measurements

[4] ppm: parts per million

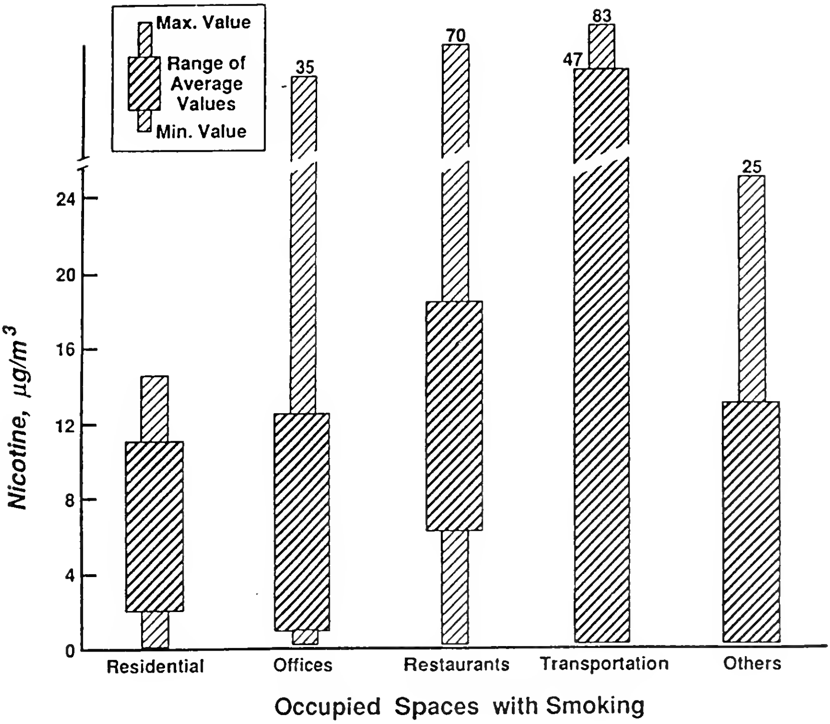

Figure 3-7. Range of average nicotine concentrations and range of maximum and minimum values measured by different indoor environments for smoking occupancy from studies shown in Figure 3-4. Only those studies with sampling times of 4 hours or greater are included in the residential and office indoor environment summaries.

ASH
ACTION ON SMOKING AND HEALTH
2013 H St., N.W. • Washington D.C. 20006 • (202) 659-4310

Thursday, November 11, 1993

Chief Medical Officer — CERTIFIED MAIL – RECEIPT REQUESTED
EACH MAJOR INTERNATIONAL CARRIER
XXXXX
XXX

RE: Formal Notice of Potential Legal Liability for Failing to Protect Children From Well Known Dangers of Tobacco Smoke

Dear Mr. XX:

The purpose of this letter is to insure that your airline is on notice of the many clearly-established dangers of secondhand tobacco smoke to young children – especially to the millions with medical conditions making them particularly susceptible – and of the potential legal liability should your company continue to fail to take reasonable steps to protect these children on international flights from this clearly foreseeable risk.[1]

In view of this information, Action on Smoking and Health (ASH) respectfully requests and suggests on behalf of its members and those it represents that your carrier prohibit all smoking as a growing number of other carriers have already successfully done.[2] This is the only way, in our judgment, to protect not only children exposed to tobacco smoke drifting into the no-smoking section, but also cabin crew members who must work in the smoking section.

Failing that, ASH suggests that at very least you no longer seat children under the age of 18 in the smoking section on international flights, where they are subjected to enormous levels of dangerous chemicals for an extended period of time with no opportunity to obtain medical assistance if necessary.

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[1] This legal analysis is based upon the U.S. law which may be applicable whenever the defendant is a U.S. carrier and/or the plaintiff is a U.S. citizen or resident, or when the aircraft takes off or lands on U.S. soil. Additionally, since U.S. torts law is largely based upon the common law our country inherited from England, many of the general principles are also applicable to the law of Canada, Great Britain, Australia, New Zealand, and other Commonwealth countries. For reasons stated herein, the Warsaw Convention is not applicable.

[2] According to published reports, the following carriers now prohibit smoking on some or all of their international flights: Air Canada, Air France, Alitalia, British Airways, Cathay, Canadian Airlines, Qantas, SAS, and Singapore Airlines.

FACTUAL AND MEDICAL BACKGROUND

The Environmental Protection Agency (EPA) recently issued a lengthy report based upon prior government reports, as well as hundreds of research studies and papers published in major reputable medical journals, which concluded that Environmental Tobacco Smoke (ETS) creates enormously serious risks for children. The agency concluded, among other things, that, even among the small subclass of children 18 months or younger, exposure to only the modest levels of ETS likely to be found in a home where only one parent smokes each year causes:

A. 400,000-1,000,000 asthmatic attacks among the millions of children who already have asthma
B. 150,000-300,000 lower respiratory infections (LRI), including pneumonia and bronchitis
C. 7,500-15,000 hospitalizations for LRI
D. 8,000-26,000 new cases of asthma among children who did not previously have the disease
E. many cases of middle ear effusion, a sign of inner ear infection

As the EPA report and many of its underlying studies made clear, these risks are not limited to children under 18 months of age. Instead, all children are at special risk, since children are far more susceptible and vulnerable to ETS than adults. Moreover, the risks to children increase proportionally based upon the level of ETS pollution to which the child is exposed, as well as the duration of the exposure.

This is particularly important because numerous studies have clearly documented what common sense and experience has long demonstrated: that concentrations of ETS in the smoking section of an airplane are far higher than those in a typical home, simply because a very large number of smokers are concentrated in a very small and poorly-ventilated area.

Thus the risk that exposure to ETS will trigger respiratory distress in a child with asthma, hay fever, allergies, or some other pre-existing condition, or will cause respiratory infection, inner ear infection, or new cases of asthma in otherwise healthy children, is very substantially increased when the child is exposed to ETS in the smoking section of an aircraft.

Several other factors further enhance the risk potential of ETS in airplanes, and undercut any argument that your carrier's deliberate decision to expose young passengers to these dangers is reasonable and legally acceptable:

A. The first is that the overseas flights during which smoking is still permitted frequently last at least five to six hours. Thus the child is exposed to these enormous and sustained concentrations of ETS for a much longer time than in the typical home which is the basis for the EPA's calculations of health risks. The

concentrations and the duration of exposure to ETS is also far greater than in a restaurant, a danger as to which sixteen states have now issued strong legal warnings and several restaurant chains are taking action.[3]

B. The second is that, should medical intervention to protect the child's health become necessary or appropriate, one cannot simply call an ambulance as is often done when respiratory distress triggered by ETS occurs on the ground. Rather obviously the kind of emergency equipment and medically-trained personnel needed to render effective medical assistance is simply not available in an airplane as it is in an ambulance or emergency room of a nearby hospital.

C. Thirdly, on international flights the air pressure and the amount of oxygen available to passengers is substantially lower than at ground level (the basis for the EPA's calculations of health risks). Thus, while the pressurization may provide sufficient oxygen for healthy adult passengers with fully developed lungs, a small child suffering respiratory distress from a breathing attack is in far greater danger of not being able to process sufficient air, and of suffering oxygen deprivation.

D. Fourth, it is well known that the sudden changes in cabin pressure experienced during landings can cause very severe and permanent medical problems for persons with inner ear infections and other related problems because of the inability of the inner ear to equalize pressure. Thus there is the added risk that an inner ear infection caused or made worse by exposure to ETS in an airline cabin could become far more serious because of the added trauma of air pressure changes during landings.

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[3] The attorneys general of the states recently issued a joint statement branding tobacco smoke in fast food restaurants a major health hazard to children, and calling for a complete smoking ban. In addition, legal actions by customers are now pending against several restaurants, even though some are acting voluntarily.

"McDonald's Corp., the world's largest restaurant operator, is considering banning smoking in its nearly 9000 U.S. outlets [in part for legal reasons]." Washington Post, 2/19/93.

ChuckECheese now advises its customers: "Since we are a restaurant concept catering to families, we are always concerned about health risks affecting children. One of those risks is second-hand smoke. Recent health advisories have studied the effects of second-hand smoke and, because of the results, we have determined <u>it is a risk we cannot afford to take</u>. Therefore, our restaurant is now a smoke-free environment." [emphasis added]

E. Finally, despite a U.S. Department of Transportation rule [§ 252.9] which mandates that "U.S. carriers shall prohibit smoking whenever the ventilation system is not fully functioning," crew members tell ASH that many flights are made with substantial portions of the airplane's ventilation system not fully functioning. This substantially increases the concentrations of tobacco smoke, and further reduces the amount of oxygen available to persons – including children – suffering respiratory difficulties.

While the very widespread publicity the EPA Report has already received makes it very unlikely that your carrier could successfully maintain that it was unaware of these dangers, ASH is nevertheless taking the liberty of formally putting your corporation on notice by this letter, and by enclosing ASH's special report on ETS which contains the full text of the "Summary and Conclusions" section of the massive EPA document, as well as references to some conclusions by other agencies.

The ASH Report being sent to you with this letter also includes more than one hundred citations to scientific and medical articles conclusively demonstrating the serious health risks of ETS to young children (as well as adults) so that your medical staff and consultants may make their own evaluation. ASH strongly urges you to make such an evaluation at your earliest possible convenience in view of the potential legal liability.

In this connection it should be noted that the Warsaw Convention is not applicable. For example, where airline attendants failed to assist a passenger whose preexisting medical condition was aggravated during flight, it was held that the injury was not the result of an "accident" as set forth in Article 17. As a result, the convention's exclusivity of remedy and limitation on damages provisions had no application, and the passenger could maintain actions for negligence as well as willful misconduct.[4]

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[4] Abramson v. Japan Airlines, Co., Ltd., 739 F.2d 130 (3d Cir. 1984). See also, Husserl v. Swiss Air Transport Co., 388 F.Supp 1246 (S.D.N.Y. 1975) (injuries which are not covered by Article 17 "may give rise to causes of action not subject to any of the conditions or limits of the Warsaw system"); Hill v. United Airlines, 550 F.Supp. 1048 (D. Kan. 1982) ("we find nothing in the Warsaw Convention to bar a lawsuit for damages as a result of the alleged intentional tort."); In re Aircrash in Bali, 684 F.2d 1301 (9th Cir. 1982) (the Warsaw Convention "has never been read to limit plaintiffs to a cause of action arising thereunder, but rather to limit the recovery in suits for injury").

POTENTIAL LIABILITY FOR NEGLIGENCE UNDER HEIGHTENED STANDARD

Should a child suffer an asthmatic attack, lower respiratory infection, inner ear infection, or other medical problem caused by exposure to dangerous concentrations of ETS in your airline cabin, your corporation potentially faces very serious legal liability – including even punitive damages – as well as very damaging publicity from any public trial.

Unlike situations where smokers claim that smoking caused their lung cancer, heart attack, or other medical conditions with long latency periods and many known risk factors, the legal issue of causation is ordinarily relatively simple to prove in situations where a person with a well-established sensitivity to a substance like tobacco smoke is exposed to it, and contemporaneously or shortly thereafter suffers an acute reaction.

Indeed, as the small sampling of legal decisions cited on page 9 of ASH's Report indicate [additional citations will be provided upon request], nonsmokers have been able to prove that ETS – in some cases even the smaller amounts of ETS drifting into no-smoking sections – has caused compensable medical problems. These cases include:

A. Smoke drifting up from a <u>first</u>-floor smoking room with the door ordinarily kept closed into a <u>second</u>-floor classroom in which smoking was not permitted was enough to trigger chronic lung disease in a teacher who was awarded $29,999.

B. A waiter who suffered a heart attack as a result of working in a smoke-filled bar received $95,000.

C. A secretary was held to be "environmentally disabled" because she could not work in an office where she would be exposed to any tobacco smoke. Her employer was required to pay her $50,000 plus $500/month for the rest of her life, even though she was free to work in any other office so long as it was smoke free.

After all, plaintiffs in a civil action need prove only that the defendant's action was a causative factor by a "preponderance of the evidence" – i.e., that it was more likely than not that it was a cause. Furthermore, legal liability attaches even if the defendant's act only served to aggravate or exacerbate a previous condition, and/or if the conduct was only one of several causes of the ultimate medical problem.

Airlines have a well established legal duty to all of their passengers – including children – regardless of who pays for the ticket. Moreover, as a common carrier, your company owes all of its passengers not just the ordinary standard of care of a "reasonably prudent person," but rather the highest possible standard of care.

This much higher and more exacting legal standard of care applies even if the passenger (or someone on his behalf) engages in an irresponsible act, Croce v. Bromley Corp., 623 F.2d 1084 (5th Cir. 1980). The standard is further enhanced and made even higher if the carrier is on notice that a passenger may have a medical condition, Suarez v. Trans World Airlines, 498 F.2d 612 (7th Cir. 1974) (airline held liable to prospective airline passenger with angina who suffered heart attack).

Since it is now well established that ETS contains numerous poisons and irritants which can and do cause respiratory distress and long-term illness to many children with or without pre-existing medical conditions, even in concentrations far less than those encountered in the smoking sections of airline cabins, it is hard to see how deliberately choosing to expose young children to ETS for long periods of time is consistent with your carrier's highest possible standard of care to protect their health and safety. This is particularly true since the carrier has no corresponding legal obligation to permit any passengers to smoke tobacco products even if they wish to do so.[5]

While the initial request to seat a child in a smoking section of an overseas flight may be made by an adult, the actual seating decision and seat assignment is made by the carrier. In the past, carriers have not hesitated to limit or assign seating based upon conditions related to health. Indeed, persons in ill health, as well as all children, are not permitted to be seated in the exit rows.

Very recently American Airlines refused to carry as a passenger (and ultimately caused to be arrested) a person with AIDS-related sores. Presumably the purpose was to protect the health of other passengers from the possible spread of the AIDS virus, even though there is very little if any evidence — and certainly no government reports — showing a significant health risk to others. In contrast, the risk of ETS to children has been clearly established and is the subject of at least one major government report. Therefore ASH knows of no legal reason why a

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[5] See 14 C.F.R. § 252.1, which states: Purpose: "This part implements a ban on smoking of tobacco on flight segments between most U.S. points as required by § 335 of Public Law 101-164. It also continues smoking restrictions on other flights. Nothing in this regulation shall be deemed to require U.S. or foreign air carriers to permit the smoking of tobacco aboard aircraft." [emphasis added]

Diefenthal v. C.A.B., 681 F.2d 1029 (5th Cir. 1982) (although travel is a "liberty interest" under the U.S. Constitution, smoker did not have a right to smoke on an airplane).

See also Grusendorf v. City of Oklahoma City, 816 F.2d 539 (10th Cir. 1987) (prohibiting even off-the-job smoking by governmental employees, and firing one for smoking one cigarette during lunch hour, did not infringe any constitutional or other right).

carrier cannot decide to seat children only in a section where they will not be exposed to extraordinary danger.[6]

Any negligence or assumption of risk by an adult in requesting a seat assignment for a child in the smoking section is not a valid legal defense in an action brought against the carrier on behalf of the child. In such a legal action the relevant issue is whether or not the defendant airline could reasonably have foreseen that its conduct would create a foreseeable risk to the child.

It is for this reason that amusement parks prohibit young children from going on rides or engaging in activities presenting an unreasonable danger to them, even if the parent is willing to accept the risk. Surely your carrier is aware that children are frequently seated in the smoking section on international flights, and it can no longer claim that it could not have foreseen that ETS might cause them medical problems.

In any event, even adult airline passengers are unlikely to be fully aware of the extent of the risks of ETS, at least to the same extent as your carrier with its superior knowledge of and access not only to the relevant medical information, but also to numerous governmental and other studies about the concentrations of tobacco smoke in airline cabins during flight.

Thus any argument that the adult – and not the carrier – was primarily responsible, or that the adult knowingly accepted responsibility on behalf of the child, is weakened even further. Indeed, arguing that adults accompanying a child on a flight are fully aware of the dangers of ETS and have a duty to protect the child, but that the carrier has no such knowledge or corresponding duty, seems somewhat ludicrous.

Moreover, since nonsmoking parents are increasingly bringing and winning legal actions when the other parent exposes the child to smoke,[7] airlines should anticipate legal actions being brought against them on behalf of the child by the nonsmoking parent, even if the smoking parent had requested the carrier to seat the child in the smoking section. Indeed, the growing number of judges who have denied custody because a parent smokes, and/or have issued orders prohibiting smoking in the child's presence (even at home), dramatically shows that courts are taking very

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[6] Similarly, business establishments frequently refuse to permit children to enter – much less to be served and seated – in places where alcoholic beverages are consumed and/or gambling occurs, even though no tangible harm results to them, and even if they are too young even to be aware of their surroundings.

[7] <u>See generally</u> Freinkel, Non-Smokers Find New Cudgel in Custody Fights, <u>Legal Times</u>, 10/4/93; Sachs, Home Smoke-Free Home, <u>Time</u>, 10/25/93.

seriously the evidence that ETS presents a major danger to young children.

In summary it is respectfully suggested that, should a child suffer an asthmatic attack or infection as a result of exposure to ETS in a smoking section, your airline could hardly claim that the injury wasn't foreseeable, or that deliberately seating a child in an area where he or she will be exposed to enormous concentrations of carcinogens, poisons, irritants, and other toxins for prolonged periods is reasonable, much less consistent with the much higher standard of care the law imposes on your airline to care for the health of all of its passengers.

Indeed, since so many businesses (apparently including some carriers) have banned all workplace smoking to protect their own employees from ETS, it would be hard to argue that limiting smoking is unreasonable, or that young airline passengers need — or are entitled to — less care and protection than adult workers.

POTENTIAL LIABILITY FOR INTENTIONAL TORTS AND PUNITIVE DAMAGES[8]

In addition to potential liability for negligence, a cause of action for the intentional tort of battery — and punitive damages for such an intentional tort — may also lie against the carrier in the same circumstances. The tort of battery occurs where one does an act with the intent that it result in a harmful or offensive contact with the body of another, regardless of whether or not the harm which occurs was intended.[9]

It must be carefully noted that courts have uniformly followed the definition of the word "intent" in the Restatement 2d of Torts to include not only actions done with the desire or purpose to cause the contact, but also actions done where the defendant had substantially certain knowledge that the contact would result. Thus, although your carrier may not have a conscious desire to willfully expose children to dangerous chemicals, it

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[8] As previously noted, the Warsaw Convention, which under Article 17 applies only to an "accident," does not preclude bringing actions for injuries caused by intentional torts and willful misconduct. See, e.g., Abramson v. Japan Airlines, Co., Ltd., 739 F.2d 130 (3d Cir. 1984) (where airline attendants failed to assist a passenger whose preexisting medical condition was aggravated during flight, it was held that the injury was not the result of an "accident," and the passenger could maintain action for willful misconduct); Hill v. United Airlines, 550 F.Supp. 1048 (D. Kan. 1982) ("we find nothing in the Warsaw Convention to bar a lawsuit for damages as a result of the alleged intentional tort.").

[9] See, e.g., Spivey v. Battaglia, 258 So.2d. 815 (Fla. 1972) (playful hug results in unexpected paralysis); Vosburg v. Putney, 50 N.W. 403 (Wis. 1891) (child's playful touch not even felt by plaintiff exacerbates his infection).

obviously has substantially certain knowledge that seating them in the smoking section will result in just such a contact.

Although some might question whether the touching of a person with secondhand tobacco smoke — as contrasted with touching a person with a solid object — would satisfy the requirements of a "harmful or offensive bodily contact," at least three decisions have held that deliberate exposure to tobacco smoke may constitute a battery.[10] See also Jones v. VIP Development Co., 472 N.E.2d 1046 (Ohio 1984) (exposure to dangerous chemicals constituted intentional tort and supports award for punitive damages); Blankenship v. Cincinnati Milacrom Chemicals inc., 433 N.E.2d 572 (Ohio 1982) (exposing workers to gases, fumes, impure air or dust fumes makes employers liable for intentional tort).

Furthermore, in a parallel development, courts have held that the intentional tort of trespass to land may occur where chemicals drift onto the land of another and cause injury, see, e.g., Martin v. Reynolds Metals Co., 342 P.2d 790 (Or. 1959) (gaseous and particulate fluorides from an aluminum smelter); Bradlay v. American Smelting & Refining Co., 709 P.2d 782 (Wa. 1985) (sulfur dioxide, and arsenic and cadmium particulate matter, all of which are present in ETS).

Your carrier may also be held liable for injuries caused to a child passenger in the smoking section under another legal cause of action generally known as the "prima facie tort." This tort occurs when a defendant intentionally does an act with substantially certain knowledge that it will cause injury to another, and without sufficient legal justification for intentionally causing such harm. See generally Porter v. Crawford & Co., 611 S.W.2d 265 (1980), and Restatement 2d of Torts § 870.

Here, while it can be argued that your carrier does not have substantially certain knowledge that any particular child will suffer injury as a result of exposure to ETS, your carrier does have substantially certain knowledge that its policy of routinely seating young children in the smoking section will cause injury to a great many over any reasonable period of time. Furthermore, where a flight attendant becomes aware from a child's repeated coughing, gasping, etc., that he is experiencing a respiratory problem in the smoking section, continuing to permit (if not actively encouraging) smoking in his immediate vicinity would seem to meet the legal requirement of substantially certain knowledge.

There are two very important reasons why parents suing on behalf of a child injured by ETS in a smoking section are very

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[10] See Richardon v. Hennly, 434 S.E.2d 772 (Ga. App. 1993); McCracken v. Sloan, 252 S.E.2d 250 (N.C. 1979) (defendant would be liable for battery if he had known of harmful effect of ETS); Portenier v. Republic Hogg Robinson Inc., BC028990, Los Angeles Sup. Ct.

likely to bring an action in intentional tort (battery or prima facie tort) in addition to one in negligence:

A. First, in a negligence action the plaintiff may have to show a reasonable relationship between the defendant's negligence and his own injuries in order to establish that his claim falls within the bounds of what is called "proximate cause." On the other hand, under intentional torts, the defendant is liable for virtually all of the damages, no matter how remote from the original intentional act. This could include everything from monetary damages for a ruined vacation to problems in school and in studying allegedly caused by the illnesses.

B. Second, courts can and do award punitive damages for intentional torts, especially if it appears that the defendant's acts were willful. Here, where your carrier is on notice of the dangers which numerous governmental bodies, private health organizations, and hundreds of individual researchers have concluded are presented to children by ETS, any decision to continue to seat them in the smoking section would certainly seem to be willful and tortious. A jury has virtually unlimited power to award punitive damages in whatever amount it deems appropriate to punish a defendant for conduct it finds was willful and wrongful under the circumstances.

CONCLUSION

The purpose of this letter is to put your carrier on notice of the most obvious and most serious legal consequences of continuing to deliberately subject children to tobacco smoke. There are, of course, others.

For example, flight attendants have advised ASH that children in the smoking section have suffered from burns: from direct contact with a lit cigarette, from contact with matches and cigarette lighters, and from small in-cabin fires caused by both. While it might be argued that the adult passengers who sit in the smoking section have assumed the risk of such injuries, the same argument cannot be made for passengers under the age of 18.

Action on Smoking and Health (ASH) must respectfully advises you that it is contacting organizations of asthmatics, organizations of parents of asthmatics, cooperating organizations of physicians, and of course appropriate segments of the legal profession to be sure that they are aware of the opportunities for legal action for various injuries growing out of an airline's deliberate policy of seating children in smoking sections.

As you may be aware, ASH's complaints have already resulted in hundreds of thousands of dollars worth of liabilities to airline carriers over the smoking issue, and ASH's ability to

win legal actions related to smoking and to assist others in doing so has been well demonstrated.[11] Indeed, the use of legal actions by nonsmokers to achieve protection from ETS has frequently been commented upon by the Wall Street Journal and others:

> The [EPA] is counting mainly on plaintiff's lawyers, rather than regulators, to drive businesses to ban smoking on their premises, and the lawyers are eager to comply. As a result of the EPA's report linking "passive" tobacco smoke to lung cancer and other ailments, a new wave of tobacco-related lawsuits is likely, legal specialists say.[12]

While we hope that no further action concerning this problem will be necessary, we hope you understand that we regard protecting innocent and vulnerable young children from the demonstrated deadly risks of tobacco smoke as a very important goal, and will take all reasonable steps necessary to achieve it.

We trust that you will be courteous enough to respond to this letter by letting us know your position on this issue, and/or by requesting additional information or dialogue to help formulate your position. ASH looks forward to your response.

Yours truly,

John F. Banzhaf III
Executive Director & Chief Counsel
AND Professor of Law,
George Washington University

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[11] See, e.g., Action on Smoking and Health v. Civil Aeronautics Board, 699 F.2d 1209 (D.C. Cir. 1983); National Ass'n of Motor Bus Owners v. United States, 370 F. Supp. 408 (D.D.C. 1974); Banzhaf v. F.C.C., 405 F.2d 1082 (D.C. Cir. 1968); Capital Broadcasting Co. v. Mitchell, 333 F. Supp. 582 (3-judge, D.C. 1971).

[12] EPA Report Sparks Antismoking Plans: Plaintiffs' Suits May Prod Firms to Bar Smoking, Wall Street Journal, 1/7/93; see also Editorial, the Raleigh News and Observer, 1/10/93: "If indoor smoking isn't curbed, some people who think they've been put at risk by secondhand smoke may wind up taking their complaints to court."

STATEMENT OF JOSEPH P. CANNY
DEPUTY ASSISTANT SECRETARY FOR TRANSPORTATION POLICY
BEFORE THE
AVIATION SUBCOMMITTEE OF THE
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION
MAY 18, 1994

Mr. Chairman, members of the committee. I am Joseph Canny, Deputy Assistant Secretary of Transportation for Transportation Policy. With me, are Dr. Jon L. Jordan, FAA Federal Air Surgeon and Mr. Thomas E. McSweeney, Director of FAA's Aircraft Certification Service. We appreciate the opportunity to discuss with you the issue of airliner cabin air quality.

I shall discuss two areas of airliner cabin air quality that are directly managed by the Office of the Secretary--smoking and disinsection--before turning the presentation over to Dr. Jordan, who will discuss other air quality issues.

Smoking

Regarding smoking, the goal of the Department of Transportation is smoke-free travel in all modes of public transportation. Over the last few years, great progress has been made in fulfilling that goal. The one area in which we have been focusing our efforts over the last two years is the elimination of smoking on international flights. In 1992, the United States cosponsored and worked hard for the passage of a resolution by the Assembly of the International Civil Aviation Organization (ICAO) to prohibit smoking on international flights. As passed, the resolution urges ICAO member nations "to take necessary measures as soon as possible to restrict smoking progressively on all international passenger flights with the objective of implementing complete smoking bans by 1 July 1996."

Because it is non-binding, the ICAO Resolution can be fulfilled only if nations acting either alone or with others ban smoking. Shortly after ICAO adopted the resolution, the Department of Transportation approved a policy of entering into regional compacts to ban smoking through multilateral agreements. By April 1993, the State Department granted authority for the United States to enter into agreements to

ban smoking, and the U.S. proposed to the governments of Australia, Canada and New Zealand a quadripartite agreement that will ban smoking on non-stop flights between these countries.

Negotiations are now in progress to produce such an agreement and, we are confident that it will be signed in the near future. This agreement will go beyond enabling passengers and crew on the routes serving these countries to travel without exposure to environmental tobacco smoke (ETS). It should serve as a catalyst for the creation of other regional compacts by demonstrating to the world community that a smoking ban on flights over 14 hours in duration is not only feasible but welcomed by passengers and crew. However, our efforts have not been limited to the completion of the quadripartite agreement between our country and Australia, Canada and New Zealand.

The Department has also been pursuing other bilateral and multilateral agreements. One of our initiatives already showed some success with the statement last week by the Government of Jamaica announcing that its highest level of authority, i.e. the Cabinet, has authorized the continuation of negotiations with the United States and Canada, with a view toward arriving at an agreement to ban smoking on all international flights between Jamaica and signatory nations. The Jamaican Cabinet also recommended that Jamaica seek the support of the Caribbean Community (CARICOM) countries for the initiative with a view to having all CARICOM states become a party to the ICAO ban.

The Jamaican announcement is a very positive development. The U.S., Canada and the 13 nations of CARICOM constitute about one fourth of all U.S. international passenger flights. We look forward to the signing of an agreement.

Our efforts to date demonstrate an unswerving determination to protecting nonsmokers from exposure to environmental tobacco smoke. In fact, to our knowledge, no other nation is so aggressively pursuing multilateral actions to advance the ICAO goal. We are particularly seeking to establish agreements that will stimulate further smoking bans. We have also held discussions with Latin American, European and Asian countries and are confident that other future agreements will also be signed in a timely manner.

The mere introduction of the ICAO resolution for a global smoking ban on international flights forced nations to give thought to the difficulties faced by nonsmokers and to consider whether the established norm should be changed. Accordingly, some nations have instituted smoking restrictions on domestic flights and others have consulted us for advice on doing so.

Airlines have also begun to voluntarily prohibit smoking on some international flights. In this country, every domestic carrier providing service to Canada has banned smoking on trans-border flights, as have Canadian carriers in accordance with their government's regulations. Two U.S. carriers offer limited no-smoking flights between the United States and Europe and one offers no-smoking service between the United States and New Zealand. We believe a substantial shift toward international no-smoking flights is underway.

We shall continue to work toward the attainment of the ICAO goal and are strengthening our efforts to achieve the 1996 deadline.

Disinsection

For a number of years, the disinsection (insecticide spraying) of aircraft with passengers and crew on board was carried out routinely by a number of nations to prevent the spread of disease and the possible infestation of crops. The United States abandoned the spraying of aircraft with passengers and crew on board aircraft 15 years ago because of possible allergic reactions and concern over long-term health effects, because of the questionable effectiveness of spraying, and because the same results could be achieved without subjecting passengers and crew to the insecticide.

Recently, we became aware of public concern over the mandatory spraying of airplanes with passengers and crew on board arriving at entry points of a number of foreign countries. Travelers objected to being forced to be sprayed with an insecticide the label of which warns that the product is hazardous to humans and that it is harmful if swallowed or absorbed through the skin.

The response of the Secretary of Transportation has been to announce that the public will be notified of this requirement where it still applies, and to discourage its continued application. Such notification will permit the public to consider alternative travel arrangements. To compile an accurate list of countries that require disinsection, the State Department, through its embassies, last month delivered a letter from the Secretary of Transportation to the ministers of transportation of every country recognized by the United States. In addition to requesting information on disinsection requirements within 30 days, the letter "urged those nations that are continuing to spray while passengers and crew are on board to reconsider the practice and spray only when passengers and crew are not on board." Our efforts must be limited to notification as these nations have a right to require the disinsection of aircraft as a matter of state sovereignity. Further, ICAO has adopted procedures for it in Annex 9 to the Chicago Convention, Facilitation.

Our approach to resolving this issue has been coordinated closely with the State Department and the Environmental Protection Agency. The State Department has been chairing a working group of these three agencies, and the Department of Health and Human Services, to share information. Under its responsibility for product labelling registration, EPA has ordered aircraft insecticide manufacturers to provide acute toxicity data from which EPA will determine the health risk of the product and will require that it be properly labelled.

Because of reports of spraying on flights to some U.S. territories, we also requested the Department of the Interior to provide us with information on the disinsection requirements of the U.S. territories and insular areas and asked that the Secretary's concerns be shared with them. Further, we indicated our interest in learning whether the Department of the Interior has administrative authority to end the disinsection requirements.

The 30-day period for reply to the Secretary's disinsection letter is drawing to a close. The State Department has received a number of responses and is sending follow-up messages to its embassies seeking responses from those nations that have not replied. As a secondary source of

information should nations delay in replying, we have requested the Air Transportation Association to request its member airlines to share any information they have on which countries require disinsection.

We expect to issue a press release shortly after receiving reports from our embassies, so that the public will be informed. We plan to make additional efforts at making certain that travel magazines and the medical community are informed of our findings.

This concludes my remarks. I now turn the presentation over to Dr. Jordan.

BEFORE THE SUBCOMMITTEE ON AVIATION
HOUSE PUBLIC WORKS AND TRANSPORTATION COMMITTEE

AIRCRAFT AIR QUALITY

MAY 18TH, 1994

TESTIMONY OF
DEANNE CLARKE
FLIGHT ATTENDANT

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Good Morning Mr. Chairman and Members of the Subcommittee.

My name is Deanne Clarke and I am a flight attendant for a national airline and a member of the Association of Flight Attendants, AFL-CIO. On behalf of myself and my flying partners, I am pleased to speak to you today on the effect of poor air quality on aircraft.

It has been over a year and a half since I worked the 45 minute flight from Anchorage to Fairbanks, during which I and my three colleagues experienced severe health symptoms. Since that time, I have been unable to work full-time and have seen countless doctors. But while it is frustrating to be so ill, what has been equalling upsetting has been my company's and the government's total disinterest concerning my and others' illnesses. The airline and the FAA have refused to do anything about our air quality problem. This is why I am here today.

I know you are all aware of the important safety responsibilities flight attendants have on board an aircraft. Besides the routine responsibilities, flight attendants must be mentally and physically prepared at all times to evacuate an aircraft during an emergency and provide emergency medical assistance to passengers. Our main concern is the passenger's safety, and it is critical that we are alert and healthy.

It is only recently that I am healthy enough to perform my flight attendant responsibilities. Let me tell you about what happened. Shortly after departure, I began to experience dizziness, nausea and my

hands started to shake. Fifteen to 20 minutes into the flight, I had to sit down because my hands were numb; I was having difficulty concentrating and I had an excruciating pain in my head.

At the same time, two other flight attendants started to feel ill. We reported the symptoms to the pilots. Our symptoms were dismissed without response. By the end of the flight, I was disoriented and the waves of nausea and pain in my head worsened. I had tunnel vision and my eyes felt like they were being pulled out of their sockets. The skin on my face felt like I had a horrible sunburn. I even experienced a burning and tightness in my chest and my heart was palpitating.

When we landed in Fairbanks, a carrier agent met our plane to help deplane the passengers. Upon deplaning, we asked the agent and other company personnel for help many times without success. I wandered around the passenger area but could not remember where I was despite the fact that I am familiar with that airport area. I felt as if I was going under anesthesia. I heard noises and voices but could not respond. My symptoms persisted as did the symptoms of the other flight attendants. One flight attendant's fingernail beds were blue, her heart was racing and her eyes were extremely bloodshot.

We continued to try to convince the company that something was wrong and we desperately needed help. We described our symptoms, but nobody showed any interest. In fact, they wanted us to get back on the plane

and continue working the trip. Finally, we managed to convince our supervisor that we were ill. She decided to send us to the hospital by company van. We arrived at Fairbanks Memorial Hospital over an hour after we landed at the airport. Our blood pressure, temperature, and glucose levels were taken. That was it. It was not until three hours after the plane had landed that a blood test was ordered to determine the carbon monoxide level in my system.

By this time, I was experiencing muscle weakness, a metallic taste in my mouth and extreme pain in my bones, joints, neck and kidneys. When I eventually met up with my colleagues, they were shocked when they noticed that my hands and lips were deep blue. When the doctor returned, he said he believed we had all experienced a lyophilic gas inhalation injury. Since the blood tests had been performed so long after the original inhalation, it was impossible to know which gas or gasses we had been exposed to.

When we returned to the airport, we were rescheduled to fly to Anchorage and then Seattle, Washington and checked in for our flight. A passenger came up to me and said she was glad to see I was alright because, following the flight, an announcement had been made that the next flight on that plane had been "cancelled due to illness of a flight attendant who suffered from an air quality problem." That was the only company acknowledgement we ever received that something was wrong with that plane and that we had, in fact, become sick.

We later learned that before we had left Anchorage, our airplane was maintenanced for a faulty thrust reverser while we and the passengers were on board. When the work was completed, the mechanics tested the engines. However, as the Auxiliary Power Unit (APU), the on ground electrical system for planes, was on, the vaporized fuel entered into the plane through the APU, the air conditioning system and four open doors. We were actually breathing vaporized fuel exhaust during pre-boarding and in-flight.

Since that horrible flight, I suffer from migraines, a damaged endocrine system and vision disturbances. I also have chronic fatigue, convulsions, a heart murmur and an olfactory sensitivity to all chemicals. I have seen countless doctors and have endured a multitude of tests including EEGs, an MRI and a full day neurological and psychological evaluation. The latter test showed that I had lost points in my IQ, and now have a learning disability, limited short term memory and cognitive functioning problems. A year and a half later, while my health has improved, I still am experiencing many of these symptoms.

Last June, nine months after the incident, my doctor allowed me to return to work but I quickly found out that I was not ready. On one of the segments, I was hit in the head by an improperly stowed briefcase and it knocked me out. Had I been alert enough to notice the briefcase in the overhead bin and properly stowed it, I probably would not have been hit by it and suffered the concussion. Later, my colleagues told

me I was a "safety risk" on those flights since I had incorrectly performed many basic and important safety tasks, such as disarming the doors. I admitted to myself that I did have neurological problems and was not healthy enough to work. I took another eight months off and returned to work in February on a part-time basis. This month, I am finally working full-time again. (The other flight attendants working that original flight also took off months of work while they recovered from various illnesses.)

Sadly, we are not the only group of flight attendants to get seriously ill from poor air quality on our aircraft. There were over 235 separate flights with air quality incidents and over 506 related flight attendant illnesses reported from July 1989 to the present on my carrier alone. These flight attendants have reported headaches, blurred vision and other health problems. The Association of Flight Attendants contacted the FAA immediately when flight attendants began getting ill. Despite numerous calls and letters, the FAA has never taken any action. In fact, my union learned last year that, in September of 1991, the FAA requested that the carrier no longer send reports on air quality incidents and illnesses to the agency. In other words, the FAA did not want to be bothered any further. The union was never notified that the FAA had stopped collecting these important documents.

I am now regularly in touch with my colleagues who experience health problems due to poor air quality. These are not isolated incidents.

On a routine basis, flight attendants are working with severe headaches, stomach pains and nausea, tingling and numbness of the hands, legs and feet, distorted vision, trembling hands and dizziness. In addition, we are often mentally confused and have a difficult time remembering simple tasks or requests. These are safety professionals, responsible for the safety and health of the flying public, who have a difficult time remembering what beverage a passenger has requested and, then, cannot even hold onto a drink without spilling it, let alone deal with any emergency or evacuation. When they arrive at their destination, they are met with complete disinterest by their company and struggle alone with their symptoms. No one is paying attention to these symptoms and working to end this serious problem.

Three weeks ago, I had another poor air quality incident. Upon boarding the aircraft, my two flight attendant colleagues and I, as well as the Captain, noticed a strong petroleum odor in the aircraft. The odor was causing our eyes to burn and we were all feeling nauseous and getting headaches. We left the airplane to get some fresh air and boarding was held off for a time. After conferring with the Captain, it was decided that we would still work the trip but the Captain would fly the plane at a lower altitude with all the airpacks working. In addition, he would order a replacement of the air filters and a check of the air conditioning ducts on his log. He also suggested that the flight attendants use oxygen if we continued to feel ill. We worked the flight despite the awful petroleum odor and despite feeling ill. Once again, our health, as well as the passengers' health and safety,

was jeopardized and the company did nothing.

The Federal Aviation Administration has also provided no support or assistance. Since the FAA claimed total jurisdiction over airline crewmember health and safety in 1975 from OSHA, the FAA has failed to make any serious effort to address occupational safety and health issues outside the area of crash survivability. Someone must take responsibility for this real problem that exists on aircraft today and begin to find a solution. Flight attendants are getting tired of reporting these incidents -- only to have their complaints fall on deaf ears. More and more flight attendants are merely quietly suffering through the problems rather than be faced with a total lack of interest.

Something in the air is affecting flight attendants and we must correct it. Too many flight attendants are facing permanent health problems and too many passengers are at risk because flight attendants, who are affected by poor air quality, cannot carry out their safety functions. I urge Congress and the federal government to move to improve the quality of air on aircraft so that other flight attendants do not suffer the same debilitating health problems that I now do.

Thank you for allowing me to testify before you and I would be pleased to answer any questions.

BEFORE THE SUBCOMMITTEE ON AVIATION
HOUSE PUBLIC WORKS AND TRANSPORTATION COMMITTEE

AIRLINE CABIN AIR QUALITY

MAY 18, 1994

TESTIMONY OF
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Mr. Chairman and Members of the Subcommittee:

I appreciate the opportunity to address the Subcommittee regarding the issue of aircraft cabin air quality. My name is James Cone. I am an occupational medicine physician with over 15 years of experience evaluating workers within the airline industry, beginning in 1978 when I was a medical student working on a study of the health effects of ozone on flight attendants. While I was a Medical Officer at the National Institute for Occupational Safety and Health, I conducted several health hazard evaluations related to flight attendant health and safety. Since that time I have worked with several different flight attendant unions on health surveys, and evaluated individual flight attendants as Chief of the Occupational Health Clinic at San Francisco General Hospital, from 1983-1991. Most recently, I have served as medical consultant to the Association of Flight Attendants (AFA), representing 33,000 flight attendants working for 21 different U.S. airlines. I and my colleagues at the University of California are currently studying the reproductive health effects of work as a flight attendant through a study funded in part by the AFA.

I am concerned about the current situation regarding airline cabin air quality for two reasons. First, I have been consulted over the past 10 years by individual flight attendants and passengers on U.S. air carriers who have experienced inflight

exposure episodes resulting in chronic health problems. I have also reviewed the results of studies of airline cabin air quality that have been performed to date, and compared the results to the recommendations, such as do exist, for indoor air quality in general.

I have concluded that the air quality on board aircraft is not currently adequate to insure the health and safety of flight attendants or passengers. Cabin air, in aircraft designed since 1981, often does not even meet the minimum air quality recommended by the American Society for Heating, Refrigeration and Air Conditioning Engineers (ASHRAE Standard 62-1989, Ventilation for Acceptable Indoor Air Quality. American Society for Heating, Refrigeration and Air Conditioning Engineers, 1791 Tullie Circle, NE, Atlanta, Georgia 30329). Cabin air is currently regulated to the extent that the Federal Aviation Administration (FAA) requires that in pressurized cabins, pressurization be maintained at a level equivalent to 8,000 feet or below under normal operating circumstances. If certificated for operation at greater than 25,000 feet of altitude, the airplane must be able to maintain cabin pressurization equivalent to an altitude not greater than 15,000 feet in the event of any reasonably probable failure or malfunction in the pressurization system (14 CFR 25.841). The FAA also requires that carbon dioxide levels be maintained at less than 30,000 ppm (parts per million), nearly 100 times the level of carbon dioxide

in outdoor air, and 30 times the ASHRAE recommended standard for carbon dioxide concentration in buildings (1000 ppm). In contrast, OSHA's proposed rulemaking on Indoor Air Quality (59 FR 15968, April 5, 1994) would require evaluation of a Heating, Ventilation and Air Conditioning (HVAC) system where carbon dioxide levels exceed 800 parts per million. The FAA's proposed rulemaking to reduce the legal limit of carbon dioxide aboard aircraft to 5000 parts per million still would leave passengers and flight attendants breathing air potentially over six times as contaminated as barely acceptable indoor air on the ground.

I, probably like many of you (at least the non-smokers), applauded the banning of smoking on domestic U.S. flights of less than 6 hours as one of the major public health victories of the past 10 years. However, instead of maintaining and improving the overall air quality on airplanes built since the early 1980's, the airlines have taken the opportunity to reduce the amount of ventilation (and by ventilation I mean only fresh or outdoor air free of contamination) provided to flight attendants and passengers.

Combined with the presence of point sources of specific contaminants (pesticides, solvents, cleaners, deodorizers, alcohol) are the volatile materials used in cosmetics, deodorants, and hair sprays, fingernail polish and other personal articles of passengers and crew, not to mention the presence of

individuals with potentially communicable diseases such as upper respiratory viral infections, chicken pox, or tuberculosis, which all may be spread through the air. The low humidity (in the range of 15% or less in most flights) places an additional burden on the body's overall hydration level and defenses against infection due to drying of mucous membranes of the nose/upper airways. Flight attendants are at generally greater risk of exposure to cabin air contaminants due to their increased exercise level and resulting increased volumes of air to which their lungs are exposed, compared with passengers. Individual flights may have additional burdens placed by malfunctioning equipment, jet fuel leaking into air intakes while on the ground, carbon monoxide from incomplete combustion of fuel, failure of air packs to function during a flight, or leaks of hydraulic fluid into the ventilation system. All of these are effectively magnified by the systematic reduction in the ventilation capacity on board newer aircraft.

Passengers and flight attendants have difficulty associating their health complaints with environmental conditions on flights, due to the time delay between exposure and manifestation of symptoms of many of the infectious and chemical exposure-related conditions which might result from cabin air exposures. This, combined with the lack of a central reporting system responsive to the complaints filed by flight attendants or passengers, results in the lack of clear data about the true extent of the

health problem associated with poor cabin air quality.

I am most concerned about my patients who have asthma or other states of increased reactivity to environmental contamination, who must increasingly choose between not flying or potentially becoming severely ill during a flight. The reduction in ventilation aboard newer aircraft, I believe, creates a situation where airline companies run the risk of not being in substantial compliance with the transportation accessibility and reasonable accommodation requirements of the Americans With Disabilities Act.

I therefore propose the following:

1. Congress should set a standard for minimum acceptable ventilation aboard aircraft which is consistent with the protection of public health (particularly the health of the most susceptible passengers - infants, the elderly and those with reduced ability to tolerate poor air quality such as asthmatics) at the same time improving the margin of safety for the cabin crew.

2. Improved reporting of air quality problems and potential health effects is needed. A national reporting hotline for passengers and crew members would help identify problems early, and provide a surveillance system which could monitor whether the

situation was improving with establishment of such a standard.

3. Increased research is needed regarding the potential nature and levels of contaminants aboard aircraft, to identify specific sources and health effects, and enable reduction in the burden of air contaminants in cabins.

4. Information should be provided to the flying public and cabin crew about the levels of ventilation aboard aircraft, preferably at the time of scheduling a flight or a series of trips. Information should also be provided to prospective passengers at the time of booking of tickets about the potential use of pesticides on international flights while passengers are on board.

Mr Chairman, thank you for the opportunity to speak before this Subcommittee. I am available to answer any questions you may have.

OBESTAR SUBCOMMITTE ON AVIATION
CABIN AIR QUALITY HEARING
MAY 18, 1994

TESTIMONY BY JOYCE HAGAN-INTERNATIONAL FLIGHT ATTENDANT

I am testifying in strong support of a total ban on smoking on all U.S. carriers operating from the U.S., to and from international destinations, for both health and safety reasons. Although this hearing is to look at the health issues, there are also compelling safety reasons for banning smoking on international flights.

My name is Joyce Hagan. I am an international flight attendant. I am here on behalf of thousands of International Flight Attendants, who CHOOSE NOT TO SMOKE. This unhealthy combination of concentrated cigarette smoke and poor ventilation for hours at a time **is** our workplace.

Cigarette smoke is the single largest complaint by passengers and crew members concerning overall air quality on international flights. There is no wall, barrier, or even curtain to separate the smoking section from the non smoking section.

On virtually every flight, passengers, in the non smoking section, complain about drifting cigarette smoke. One family complained as smoke poured from the smoking section, behind him, his wife, and several small children, for 10 1/2 hours.

I have had many, passengers ask for a wet cloth to put over their nose and mouth to filter out the smoke. One man slept with a wet handkerchief over his face. I have even seen a passenger wear a white face mask for the entire flight, removing it only to eat. Smoke drifts easily and we all breath it.

One businessman, who suffered hours from the drifting smoke of a chain-smoker, began to fan away the smoke. The chain-smoker became highly irritated by his fanning and began to deliberately blow smoke in his direction. The situation became very tense as the chain smoker asserted his "right to smoke" for the next 8 1/2 hours.

As I watched, I was struck by the fact that our work situation is unique. One cannot open a window, take a walk during your lunch hour, or step outside for a breath of fresh air. Our enclosed work environment is probably the worse case scenario for environmental tobacco smoke imaginable. Yet, in this situation, smokers, who are in the **minority**, are granted 100% of their right to smoke, 100% of the time. Non-smokers, who are in the **majority**, are granted 0% of their right to breath clean air, 0% of the time.

Any flight attendant or passenger, for that matter, who has been exposed to cigarette smoke on an international flight for hours and hours, knows that high

concentrations of cigarette smoke generated from the smoking sections cannot be compensated for by increased ventilation. You don't have to be an expert witness here today to know this is true, you only have to experience it. Airplanes are simply not designed to handle this situation. We have no separate ventilation system for smokers. If this were your workplace, and you **chose** not to smoke, this situation would be a nightmare.

The confined atmosphere in which we work is now known to be toxic and carcinogenic, causing respiratory disease, cancer, and heart disease. I can now see the effects of my own exposure to environment tobacco smoke for the past 8 years. On May 6, my doctor advised me that I have the beginnings of a lung disease commonly seen in smokers. It began with a chronic cough about 9 months ago. I must now use a steroid nasal spray, 3 times a day during flight, in addition to daily oral medication. I am not alone in this situation. Attorney Stanley Rossenblatt, from Miami, Fl., is currently representing thousands of flight attendants who have been injured by their years of exposure to environmental tobacco smoke on both domestic and international flights.

Since the EPA report in January 1993, my efforts to get appropriate action from the DOT/FAA in this regard have been frustrating. I have repeatedly written, faxed, and phoned, the FAA to request that they take some action.

I think what has angered so many flight attendants is that the EPA has determined that ETS, environmental tobacco smoke, is a major health risk, and yet, to date, there has been no initiation of ANY kind of action to even begin to CONTROL of smoke in an airliner cabin. Cumbersome bureaucracy and delay seem to be the rule. **We cannot imagine a more appropriate health issue in which the FAA has authority to act.** Why then, has the FAA failed to act?

I believe that the FAA is both unwilling and unable to act on our behalf because of conflicting objectives. The FAA has the responsibility for the occupational health of cabin attendants and the responsibility to promote commerce of the airlines. The result is that this health (and safety) hazard is being left unattended by the FAA, even though the FAA has authority to regulate it.

In my many conversations with the DOT/FAA, the responsibility to promote commerce is repeatedly mentioned as a reason why the FAA does not act on it's health responsibility and ban smoking. "Its purely economical" and "The FAA will not take any action that may render and U.S. carrier less competitive." I now know that the FAA supports whatever the airlines support.

ICAO, the International Civil Aviation Organization, is the multilateral agreement that the airlines, DOT, and FAA support. ICAO has proposed a smoking ban on all international carriers effective July 1, 1996. This agreement is not enforceable. It can do little more than "urge" and "request" participating airlines to act. Although progress is being made in other countries, Europe is not one of them.

While a world-wide smoking ban would be preferable in that it would protect the health and safety of all airline crews and passengers, its time has not yet come. Many countries do not feel that smoking and environmental tobacco smoke is a serious health threat Meanwhile, we are dying in the smoke while we are waiting for these countries to come around to our way of thinking. Although the FAA has chosen to embrace the ICAO agreement and support a multilateral ban on smoking on international flights, it is still incumbent upon the FAA to protect the affected U.S. aviation employees and traveling public, for which it is responsible, from hazards posed by this carcinogen on board U.S. carriers.

It is entirely possible that we (flight attendants) will work for another 2 years in the smoke, only to find out certain countries have decided not to comply with the agreement after all. We will then find ourselves in the exact position that we are today. U.S. carriers would then want smoking on competitive flights. I asked the FAA what action it would take if this situation occurred? The answer was "I don't know, we would have to evaluate what action is appropriate if that happens" More delays, more bureaucracy, more inaction. If smoking is not banned on U.S. international flights, I feel strongly that the American people should be warned of the health risks. Perhaps a sticker on each ticket purchased. **"Caution, international flying is hazardous to you health."** This could be along the same lines as Senator Leahy's yellow sticker warning passengers that they may be sprayed with an insecticide.

The ICAO agreement also "urges all Contracting States, in the interim, to restrict smoking progressively on all international passenger flights with the objective of implementing complete smoking bans on July 1, 1996." We have seen very little restricting of smoking on flights to Europe since the agreement has been signed.

When I first began my efforts to get a smoking ban on international flights, I had no idea that the FAA was so strongly involved in the promotion of commerce of the airlines, even to the exclusion of other responsibilities. I believe that the responsibility to promote the airlines should not be in the realm of responsibilities of the FAA. All responsibilities of the FAA should be reviewed conflict of interest.

I have had several conversations with the DOT/FAA asking for some controls on smoking, until a ban could be accomplished.

I have asked the FAA to set some air quality standard concerning ventilation? Would the FAA at least require that the passengers be seated in order to smoke, for safety reasons? (Referring to the picture of cigarette butts on the carpet floor of a B767.) I was told that they would "need more than that to take action."

I have asked the FAA to ban smoking for both health and safety reasons. Smoking and the accompanied use of matches and cigarettes lighters in the airline cabin have posed, and continue to pose, a serious threat to the safety of

passengers and crew. If we get into trouble, our alternatives are much less than a domestic flight. Most of the time there is no nearby airport in which to quickly land.

I asked that the FAA require that passengers must be seated to smoke for health reasons. This would eliminate the build up of concentrated smoke near lavatories and flight attendant work galleys.

I asked the FAA if they would require the passengers only be allowed to smoke for example 15 minutes out of the hour, in order to give the many non-smokers a right to breath smoke free air? I asked for initiation of any regulation to begin to restrict smoking for health and safety reasons. I asked for any good faith action that would demonstrate that they were interested in acting on their responsibility for health issues. The answer to all questions was "no." It would take just as long (years) to get a small regulation enacted as it would to get a total ban on smoking.

There is a "Petition for Rule Making" pending with the FAA to ban smoking on International flights. Docket #36566AGC-10 filed May 31, 1991. The FAA advised me that this is now about 117th on the list. I was also advised that even it were next, it would not be acted on because it may place U.S carriers at a competitive disadvantage, therefore the FAA will not act. Write your Congressman.

I asked what the FAA is doing on our behalf? The answer was **"We are evaluating what regulatory action is appropriate."** I asked about how long this would take? Answer was "no time span has been set." I was told that the FAA would also be "looking into the process of petition to rule making" and "looking into moving up the ICAO date."

I asked what would be the action of the FAA if asbestos (another Group A carcinogen) were found in the seat cushions of each passenger seat. The answer was "I don't know, we would have to evaluate what regulatory action is appropriate."

I am now truly convinced that the decision to ban smoking on international flights SHOULD be in the hands of Congress. This decision cannot be left up to the bureaucracy and politics of the FAA or the vested interests of individual airlines. (Leaving it in the hands FAA is the same as putting it in the hands of the airline industry, with their vested interests.)

What about partial bans on smoking?

The current trend in the airlines is to ban smoking on selected flights is only a test. If this should however, become permanent, the suffering of some non-smoking passengers would be relieved, but nothing has been done to protect those who are at highest risk, the flight attendants, who do this for a living.

Likewise, it does not solve the problem to, for example, legislate that just children and infants, cannot sit in the smoking section. On some airlines, passengers are permitted to book a non-smoking seat and then come to the back of the aircraft and smoke. The smoking parents would then book non-smoking seats and then stand and smoke in the back of the aircraft. Many smokers do not want to sit in the smoking section for various reasons:

1) It's too smoky and ventilation is poor,
2) One member of their party is a non-smoker and refuses to sit in smoking,
3) Couldn't get the window or aisle sit they wanted in the smoking section

They stand in the back of the aircraft and smoke. This situation creates a continuous flow of second hand smoke in the back of the airplane, near most lavatories (and often the accumulation of smoke sets off the smoke detectors) and flight attendant work galleys. It also poses a safety hazard as demonstrated by the pictures of cigarette butts on the carpet floor of a B&67. Anything short of a total ban on smoking would not protect flight attendants' workplace. A complete ban on smoking is needed for health and safety reasons to protect passengers and crew.

I do not believe that one can automatically assume that airlines will lose money if smoking is banned on international flights. I believe that the benefits will outweigh the costs.

There are many benefits and savings to a smoking ban in the area of:

1) Present and future health of employee,
2) Improved productivity, reduced absenteeism,
3) Increased comfort to the majority of the passengers,
4) Cleaning of cabin aircraft interior and air filters,
5) Elimination of odors and improving overall cabin air quality.
6) Savings to carriers from reduced risk associated with employee litigation stemming from the development of illnesses related to ETS
7) Eliminating the frequent conflicts passengers have over seating arrangements and their proximity to the smoking section.
8) Greatly reduced possibility of in-flight fires

While U. S carriers may loose some smoking passengers to foreign carriers who have smoking, so will we gain non smoking passengers from foreign carriers. Since the majority of passengers do not smoke, there is a larger available pool of passengers to draw from.

We are not denying passengers nicotine. Alternatives are available to smokers that are not available to non smokers. For example, nicotine gum and patches can be used by smokers to help them "get through the flight." But clean air is <u>not</u> available to the non smoking passengers to help them "get through the flight."

83-115 O - 94 - 9

It's easy to say "fly domestic" or "get another job" but else are harsh remedies for these economic times, and financially not possible for many. This does not solve the problem. Someone else would have to take my place and breath the second-hand smoke, perhaps also becoming sick. Many health problems take years of exposure to show up. There can be no justification to allow this to continue. Not knowing what we know today. The only solution is to ban smoking, as you did on domestic flights. The bottom line is that cigarette smoke makes people sick. It's making many of my colleagues sick. It's making me sick. It's about being able to breath.

I would like to say here that **smoking is not permitted in any building of my company for health reasons**. All employees of this company, except international flight attendants are provided a smoke free environment in which to work. International flight attendants are the only employees of my company that are required to work in a Group A carcinogen. We don't want to have to choose between our health and our job. We fell through the cracks once, when smoking was banned on domestic flights and not international flights. But because of the EPA report, we now know that environmental tobacco smoke is no longer just a nuisance.

We're testifying today to make sure that the uniqueness of our workplace does not somehow exclude us from legislation to ban smoking in public places. (I'm here to say that 250 or more people, crowded in a very small space for an extended period of time, is about as 'public place" as one gets.) This is about one's most basic right to work and breath. Ban smoking on international flights, it's the right thing to do.

James Oberstar Subcommittee on Aviation

DOT/FAA Activity Log.

2/20/93

Arny Konheim (Senior Policy Analyst, DOT)
Suggested I call Don Newman, US Rep to ICAO
Advised of Study 1989 DOT on cabin Air
(in later months said that incidences of Cancer in F/A not great)
Gave me name of John Walsh, Chief Councils office, FAA

2/20/93

John Walsh
Wanted "off record conversation"
Advised and sent info showing FAA had responsiblity for health
Suggest Petition for Rule Making

2/27/93

John Walsh (Chief Council, FAA)
received 1986 copy of NAS study

Attempt to get DOT/FAA to act on occupational health & safety.

9/23/93

John Walsh (Chief Council FAA)
Referred to Donnell Pollard/David Harrington

9/28/93

Donnell Pollard (FAA area of Safety)
Advised Petition for Rule making can take 5 years
Contact Congressmen, newsmedia
Congress excluded International Flights, Congress must include
Reason is competativeness

11/15/93

Ron Welding ATA

11/15/93

Tim Kelly (Governmental Consumer Affairs)
Responded to the letter I send Pena
Questions not being ignored, DOT simply do not choose to act on health, prefer to pursue multilateral agreements of ICAO

11/19/93

Larry Youngblut w/ FAA (Safety matters)
Fax info (NAS study)
Interested in matter of standing and smoking
Sent pictures of cigarette butts on carpet floor

11/22/93

Tim Kelly, DOT govermental affairs

Reguarding letter I sent to Pena and was answered by Tim Kelly.

Mr Pena had not seen the letter or Response

Asked him to comment further on the responsiblut of FAA for health. He said I just didn't like the answer.

11/23/93

Arny Konheim (Senior Policy Analyst, DOT)

Good point about "occupational health" ICAO not looking at that

Interested in standing and smoking - sent pictures

Decision purely economical on behalf of airline

11/24/93

OSHA - Take over responsibility for crew health/safety?

11/24/93

Dr. John Jordon (Office of Aviation Medicine- FAA flight surgeon)

Referred to Dr. Andy Horne concerning Smoking matters

Wrote letter, mailed copy of Pena letter, Dr Whaley comments

11/29/93

Secy Pena - (C-Span, live call in show "Booknotes")

Asked about FAA responsiblity for Health, why no action, ICAO 2/1/2 years off and too long to wait

He agreed. said he'd look into it

1/3/94

Mark Gerchick's office (The Chief Council of FAA)

Referred to Pam Trebbe (Special Assist to Mr Gerchick)

Wanted to know why FAA would not act on health

1/3/94

Mr Arnold Konheim,(Senior Policy Analyst, DOT)

Asked about follow up to Pena's C-Span call, he felt Mr Pena would help if he said he would

1/3/94

Larry Youngblut (FAA safety matters)

Forwarded pictures to Donnell Pollard [illegible]

Told me Chief Councils office will not respond to my questions about occupational health responsibilities. They determined FAA does have authority to act on health. This is the responsibility of Flight Standard to enact regulations

Said nobody wants to touch this topic (off the record)

Mr Youngblut still trying to 'get me an answer' as to why no action.

1/4/94

Mr/ Michael Jennison/ FAA Chief council's office
Suggest I speak with Mr Konheim or John Walsh
Asked why FAA is not acting on health
Tried to get me to call other people
Suggested I write a letter if I wanted a response in writing, advised I did that.
Asked him to find out answer and call me back

1/7/94

No response, Caled **Mr Jennison** back, he was curt, said he'd call me right back
Hours later, no call
Called back, attempted talk to Mr Gerchick

1/10/94

Referred to **Mr Konheim again**

1/11/94

Called **Larry Youngblut** - said ball is back in hands of flight standards

1/18/94

Called **Mr Accardi** (Administrator for Regulations and Certification)
Referred to assistand Bill White
Faxed Mr White copy of letter I sent to Mr Youngblut in which I was asking for a response reguarding occupational health

1/21/94

Dr Jordon
Faxed copy of letter I sent to Mr White. Explained we are now asking for a smoking ban on all American carriers..not just international (takes too long)

1/2594

Mr Bill White - unable to reach
Jim Mundy returned Mr White's call
He put me in contact with Alberta Brown with AFA (unable to help)

1/27/94

Mr White, FAA Flight Standards
Promised to try to do something about regulating standing and smoking
Later said was unable to do this
Asked status ofDocket #26566AGC10

1/2794

Anne Correy (Delta Airlines, Manager Line Operation

She advised Ron Welding w/ ATA about attempt to regulate standing and smoking

1/29/94

Donnell Pollard (FAA, Safety matters)

Asked about Docket #26566AGC10 to ban smoking on Intl - said about 117th on list. Said even if 1st, FAA would act because it may render a US company less competative.-said this responsiblity has priority.

1/31/94

Mr White,FAA Flight Standards

Turning me over to Dave Harrington, Manager, Air Transport Division of Flight Standards

Mr White said they were approaching the whole smoking situation from a Safety point of view, not health.

1/31/94

Mr White,FAA Flight Standards

Petition for Rule Making docket I asked about was "on hold"

Asked for info on inflight fires due to smoking

Recived, but unreadable...bad copy

1/31/94

Secy **Pena"s office**

Requested to speak again w/ Mr Pena

1/31/94

Dave Harrington,Manager, Air Transport Division of Flight Standards

Will "look into" some way to make them have to sit down to smoke for safety reasons. Was not encouraging

Asked for something in writing about FAA's resp. for occupational health and why no action...even in a small way? Asked for comments on FAA's views of EPA report, and ETS as a major health risk to F/As. Said he would respond. Note: letter left out reference to these two points I had asked about. Only spoke of pursueing ICAO.

2/7/94

Secretary Federico Pena

Spoke with him.

He sent memo to David Hinson asking for options

He advised he banned smoking at Denver Airport when Mayor

I advised, poor ventilation, standing and smoking, cigarette butts on carpet floor, sitting on jumpseats and smoking. Advised ICAO may not happen for all countries. Advised 2 1/2 years is too long to wait while working in carcinogen. He agreed.

2/23/94

Dave Harrington,Manager, Air Transport Division of Flight Standards

Said formed a Commitee to look into standing and smoking. Will try to link it with passengers not beging allowed to gather in small groups.

Useless attempt

3/7/94

Dave Harrington,Manager, Air Transport Division of Flight Standards

Received letter requested. No mention of occupational health and FAA responsibility and how it fits in

Send letter once again asking that reference be made to health and EPA report.

3/29/94

Dave Harrington,Manager, Air Transport Division of Flight Standards

He commened and laughed about the fact that the letter he sent to me at my request was not signed by him.

Said he was unable to regulate standing and smoking for safety or heath reasons.

Said that this issue of smoking was "Bigger than the FAA, Bigger than Dave Harrington"

4/18/94

Dr John Jordon

Requested response from letter that was sent (still no response)

4/18/94

Jean Lewis /F/A- said Dr Andy Horne also told her to fly domestic, reasons not to ban were purely economical on the part of airlines, smokers have rights too.

4/22/94

Arnold Konheim,(Senior Policy Analyst, DOT)

Called for Secy Pena

Said the DOT had decided to do to things. 1) Look into the process of Petition for Rule Making and 2) Look into moving up the ICAO date

Said cotinine testing of F/As was not possible

4/25/94

Secy Pena's secretary

Advised I had spoken w/ Mr Konheim, was dissappointed in the lack of action by the FAA on it's responsibiliy for health

Asked for "crumbs". Will the FAA at least being to restrict smoking until a ban comes.?

It was suggested I write to my Congressman

5/5/94

Tony Broderick (Associate Administrator for Regulations and Cerfication)

Asked about FAA responsiblity for health. He said there were 'other considerations, like the fact that American carriers <u>may</u> loose revenue of smoking passenger.

He asked my exact position. Should smoking be banned on all American Carriers operating internationally? I said , yes, absolutely, yes.....

He said the "FAA is evaluating what regulatory action is appropriate" No time span is anticipated. He said Congress made the decision,.

I asked about some action being taken to begin to restrict smoking...he said small regulations take just as long as big ones.

U.S. Department of Transportation
Office of the Secretary of Transportation

400 Seventh St., S.W.
Washington, D.C. 20590

October 7, 1993

Ms. Joyce Hagan
115 Spalding Dr.
Atlanta, GA 30328-1912

Dear Ms. Hagan:

Thank you for your letter to Secretary Peña concerning smoking on international flights. I can appreciate the reasons for your concern.

The ban on smoking on flights within the U.S. does not apply only to domestic service; it includes portions of international flights that operate between U.S. points. This aspect of the ban applies to foreign airlines as well as U.S. carriers. This is the first time that the federal government has extended its smoking rules to foreign air carriers.

However, we do not enjoy the same degree of flexibility to take unilateral action on international flight segments that we do on segments within the U.S. This is especially true with respect to foreign airlines, and yet to ban smoking only on U.S. carriers would cause them competitive harm. It has been argued that smoke-free flights could be a competitive advantage for U.S. carriers, but it is not clear that this would be the case on flights to countries where smoking is more culturally acceptable than it is in the United States. Nonetheless, the Department of Transportation has stated that it is interested in seeing smoking banned on international flights. The Department has been working through the International Civil Aviation Organization and other bodies in order to accomplish this.

We currently require U.S. carriers to provide a no-smoking section on all international flights, and unlike some other regulations this rule applies even to flights between two foreign points. There must be a no-smoking section in each class of service on these flights, and these sections must be expanded if necessary to accommodate everyone who wishes to sit there. Smoking is banned whenever an aircraft is on the ground and whenever the ventilation system is not fully functioning.

[redacted] are free to ban smoking on their own if they choose. Our rule requires no-smoking sections, but not smoking sections. It also states explicitly that "[N]othing in this regulation shall be deemed to require carriers to permit the smoking of tobacco aboard aircraft." There is no "right to smoke" on U.S. airlines. For example, U.S carriers serving Canada have banned smoking on flights between the United States and Canada. Since smoking in the cabin could be viewed as a working condition, there is

Ms. Joyce Hagan
October 7, 1993

Page 2

nothing to prevent airline employees from entering into collective bargaining with their employer on this point.

We realize that smoke can drift into the non-smoking section, and that non-smoking flight attendants cannot avoid working in the smoking section. This can unquestionably cause irritation and discomfort. However, the health risk to a flight attendant who makes several international flights a week may be different from that of a person who lives with a smoker, which is the environment that most studies of "passive smoking" have examined.

We have entered your comment in our computerized industry monitoring system, which serves as a basis for research, rulemaking and legislation. Thank you for taking the time to share your views.

Sincerely,

Timothy J. Kelly
Industry Analyst
Office of Intergovernmental and
Consumer Affairs

THE EMORY CLINIC, INC. AT PERIMETER

875 Johnson Ferry Road, Atlanta, Georgia 30342 Telephone (404) 248-6100 Fax (404) 248-6160

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Ophthalmology
Orthopaedics
Otolaryngology
Physical Therapy
Rheumatology
Surgery
Urology

Administrator
Mickey S. Pickler

May 6, 1994

To Whom It May Concern:

Joyce Hagan first consulted with me on 3-30-94 for a chief complaint of a persistent dry cough. She had noted these symptoms for the past 8 months. She denied any sputum, hemoptysis, wheezing, or shortness of breath.

Her exam was remarkable for a mildly deviated septum, an erythematous posterior pharynx with a cobblestone appearance, and a wheeze was heard throughout her lung fields with coughing only.

Her chest x-ray did not show any acute pulmonary infiltrates.

However, most importantly, her pulmonary function studies did show a serious abnormality. Although her spirometry was normal, there was a significant decrease in her forced expiratory flow rate at 25 to 50 percent of her forced vital capacity (FEF25-75). A FEF25-75 below 70% of predicted indicates small airways disease which is the earliest obstructive lung disease pattern seen in cigarette smokers. Joyce's measurement was 56%. In addition, her flow rate at 50% of her forced vital capacity (V max 50) again was abnormal at 50% of predicted. This indicates mild obstructive lung disease of the small airways.

Her history and exam were compatible with a chronic respiratory irritation or allergy. Therefore, she was placed on Hismanal, an anti-histamine and Vancenase AQ Nasal Spray, an anti-inflammatory steroid, in an attempt to alleviate her symptom.

On her return visit on 4-15-94, she related that her cough had improved temporarily but had worsened again during her two international flights. She had just returned from her second international flight the previous day.

He exam revealed bilateral swollen nasal mucosa and a raw, cobblestone appearance of the posterior pharynx. Her lung exam was normal.

A review of Joyce's records from her previous physician showed a diagnosis of upper respiratory infection with developing laryngotracheal bronchitis on

Page 2
Re: Joyce Hagan

6-29-93. She was also seen on 1-14-94 with an upper respiratory infection and a secondary otitis media. The onset of these problems were correlated with a recent flight to Europe.

Joyce's upper respiratory symptoms may well be caused, if not aggravated, by her exposure to heavy doses of environmental tobacco smoke on her job as an international flight attendant.

Exposure to environmental tobacco smoke can be compared to rubbing salt in an open wound or dirt into an infected sore - no matter what antibiotic or treatment is given, one cannot expect them to heal. Similarly, Joyce's cough and upper respiratory symptoms are likely to continue as long as she is exposed to tobacco smoke. In addition, the results of her spirometry indicate that she is at high risk for the development of obstructive lung disease as a result of her previous exposure.

Sincerely,

Karen L. Warren

Karen L. Warren, M.D.

KLW/bd

...and undermine combat ...ing the transition period.

...opinions are opposed to those of President Yeltsin, who sent a message to Western leaders warning them against extending membership to the four eastern European countries which are candidates to join. Russia's Defence Minister, Pavel Grachev, and its High Command regard the alliance as potentially anti-Russian.

...sert ...e said ...corps. ...Nato say ...join because

...mon-...rain dance."

...dward cites an instance last November in which several people were killed when a coach without seat belts crashed in England. Robert Kee, the junior transport minister, said that European law prevented compulaory seatbelts. "The fact that the minister sided against the EU epitomises the adverse attitude," says Sir Edward.

Article in full: page 6

...urse ...Paris ...r rally

...s of ...on an average ...ople a year ...d on the Paris-...ly. But for the ...years, it has ...n without a ...This month, ...the rally claimed ...her victim. ...ansen lived for ...s-Dakar rally. He ...died for it. The ...re his motorbike ...fatal collision ...r in Mauritania, ...ned negotiated a ...ough the sands, ...ave an ...to *The* ... He told how ...fascination for ...y – a fascination ...now killed him.

...**Interview: p14**

Germans fume over attack on smoking

Tony Paterson
BERLIN

GERMAN smokers sneered when France introduced draconian anti-smoking laws 14 months ago. The measures were branded a sop to American-inspired health fanaticism and an assault on individual rights. But a shock anti-smoking resolution from a wide section of the Bonn parliament has wiped the smirks off the faces of the 32 per cent of Germans addicted to tobacco.

The resolution put forward by Roland Sauer, an MP who heads the anti-smoking lobby in Chancellor Kohl's ruling Christian Democratic Party – envisages a smoking ban in public buildings, on transport, at work, and also in pubs and restaurants. Employers and pub landlords would have to designate 25 per cent of office or pub space as smoking zones. Those failing to do so and anyone caught having a surreptitious puff in non-smoking zones could face fines ranging from Dm 100 to Dm 5,000 ($3,000).

MICHAEL

It's not a referendum, somebody lit a cigarette!

The idea has support from opposition Social Democrat MPs; and the president of Germany's Doctors' Association, Karsten Vilmar, also wants a "health tax" put on the price of cigarettes.

Although French, British, and Italian smokers are used to restrictions at work and in eating places, most German employers and restaurateurs permit smoking almost everywhere.

"There is an attitude problem in Germany," a spokeswoman for the anti-smoking lobby said. The Federal Cigarette Association's deputy director, Ernst Brückner, said: "The smoking citizen will not accept such a law."

19 Europe's top 500 companies - page 25

The European Newspaper
#191 9-13 January 1994

REPRESENTATIVE OF THE UNITED STATES OF AMERICA
TO THE
INTERNATIONAL CIVIL AVIATION ORGANIZATION

TELEPHONE
(514) 285-8304

SUITE 753
1000 SHERBROOKE STREET WEST
MONTREAL, QUEBEC, CANADA
H3A 3G4

December 22, 1993

Mr. Dale McDaniel
Acting Assistant Administrator for
Policy, Planning, and International Aviation
API-1, Room 1005D
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Dear Dale:

Please find enclosed a letter and photos from Ms. Joyce Hagan. As you will note from the letter, there is a strong concern about smoking on airlines by a significant group of flight attendants. The photos bear out the concern voiced by this prestigious group. Also, there is a safety concern as well as a health one that is being recognized by these flight attendants. This should be included in our ICAO report which solicits this type of information from the U.S. Government.

The issue of environmental tobacco smoke (ETS) and its health concerns have not been well documented. [redacted] U.S. [redacted] ~~is in an excellent position to take a strong stand on this issue.~~

Sincerely,

Don M. Newman

Enclosure: As stated

cc: Ms. Joyce B. Hagan
115 Spalding Drive
Atlanta, GA 30328-1912

1993

Ask the Doctor

Q: This is regarding Dr. Whaley's recent response to the question regarding Carpal Tunnel Syndrome. I know of several Flight Attendants who have this disorder and I have also had problems with it. I think this is related to my duties as a Flight Attendant as the symptoms only flare up while I am at work. Can Dr. Whaley comment on this?

A: Thank you for your feedback. As I mentioned in my first response, my opinion had been discussed with a neurological consultant who has particular interest and expertise in the diseases of the hand and wrist. In response to your additional question, I have broadened the group of experts to whom I have presented this information to include a group of physicians whose entire practice is with the hand and carpal tunnel. They have reviewed the letter from the Flight Attendant and have provided for me a review of the Medical Literature. The following is a summary of two of the Medical Literature articles reviewed. One study from the Journal of Hand Surgery, May 2, 1988, looks at industrial employees from 27 different occupations in 4 different industries to evaluate the role of occupational hand activity as a risk factor for the Carpal Tunnel Syndrome. "No consistent association was found between the type and the level of occupational hand activity, and the presence or severity of (Carpal Tunnel Syndrome)". These authors also noted that findings consistent with this disorder can occur in both hands of individuals who have the complaint in only one hand and in whom only one hand is utilized in the occupational activity.

A second article from September, 1992, from the same journal was a longitudinal study over time of the relationship to age, gender, hand dominance, and occupational hand use in Carpal Tunnel Syndrome patients. These authors found that the diagnosis of Carpal Tunnel Syndrome did not correlate in any fashion with occupational hand use, but were correlated with age and hand dominance rather than "any job related factor". What this actually means is that Carpal Tunnel Syndrome is "an extremely common nerve entrapment" and is, in fact, the most common nerve entrapment that exists. In addition to this fact, there is a high predominance of females afflicted with Carpal Tunnel Syndrome as compared with males, with a ratio of females to males being anywhere between 3:1 and 8:1. Therefore, in many groups of females, it would not be unusual that a certain percentage of them would have symptoms of Carpal Tunnel Syndrome unrelated to any direct occupational cause. The same could occur in males, but also would not be related to any "direct occupational cause".

These studies indicate that Carpal Tunnel Syndrome is common, occurs frequently enough to be seen in many occupational groups, and cannot be consistently demonstrated to be the result of any occupational activity including that of Flight Attendants. It would be appropriate, however, that if some particular movement causes symptoms, then that movement should be corrected and performed in a different manner.

Q: [redacted] media focus on the serious effects of secondary smoke. As a crew member operating in a close aircraft environment on international flights. I am quite concerned about exposure to this smoke and its effect on my health. Can you provide some insight into the validity of these recent findings and how flight crew members might be affected?

A: This is an interesting question and one that is more difficult to answer than might appear at first glance. The aircraft environment is one that is associated with a known increase in upper respiratory type symptoms because of the reduced humidity and exposure to individuals who may be carrying viruses and other respiratory infections.

The United States Environmental Protection Agency, along with various other groups, issued a report in December of 1992 which totals in excess of 500 pages and the "Executive Summary" is sixteen very complicated pages. Much of the material analyzes research papers from around the world. These studies reviewed the incidence of respiratory infections and malignancies in the children in homes where one parent smoked and the other did not. For fairly obvious reasons, the largest numbers of households were represented by a smoking father and non-smoking mother. Most of the arguments and statistical data therefore depends upon exposure to smoke for a prolonged period of time over a long number of years, such as would occur in a close household contact environment. Some of the predictions, although they are mostly statistical and analytical, would be that there would be 150,000 to 300,000 cases per year in this country of bronchitis and pneumonia in infants and young children under the age of 18 months. There would also be an increase in upper respiratory irritation, middle ear and other infections. There would be the possibility that up to 1,000,000 asthmatic children could have their condition worsened by exposure to environmental tobacco smoke. In adults, it would be predicted that in this type of close association, there might be as many as 3,000 cases of lung cancer in U.S. non-smokers annually out of a total number of predicted new lung cancer cases during 1993 of 170,000. As you can see, the actual proportion of lung cancer cases occurring in non-smokers which would be attributed to environmental tobacco smoke is quite small. It is my opinion that flight crew members who are sensitive to environmental smoke might have more trouble from eye and upper airway irritation than any measurable or realistic risks of "malignancy" from exposure to environmental tobacco smoke during the work life of an international air crew member. Certainly the risk of living in the home of a smoking spouse or working in a 40 hour week type environment with smoking co-workers far outweighs the possible hazards of exposure to environmental tobacco smoke in the hours, schedules and proximities that occur in commercial aviation. I really believe that the risk to flight crews is minimal and hope that this information will reassure those of you who have expressed concern.

ROBERT GRACE HEALTH CENTER
3585 Peachtree Industrial Boulevard. • Suite 102 • Duluth, GA 30136 • (404) 497-9700

FAMILY CHIROPRACTIC

ROBERT D. GRACE, D.C., P.C.

3/28/94

Ms. Beth Welker and Joyce Hagen
c/o Delta Airlines
1020 Delta Blvd.
Atlanta, GA 30320
Dept. 610

Dear Beth Welker and Joyce Hagen,

This letter is in response to the recent article written in the Atlanta Journal & Constitution called "Support growing for smoking ban on overseas flights".

As a doctor, I have always been concerned about the dangers of smoking and especially second-hand smoke. I am personally opposed to smoking in any public facility or workplace. My father is a reformed smoker who smoked for 30+ years and is now at age 77 enjoying cleaner lungs and better health since he quit smoking almost 15 years ago. In addition, my brother Chuck Grace is a pilot for US Air and is opposed to smoking on any airlines.

I wanted to express my gratitude for your endeavors to stop the smoking in overseas flights. I can imagine being attendants, it is horrible to have to always be exposed to that especially if you are having bouts of bronchitis and fluid in your ears as a result.

Please let me know what I can do to help put a stop to this activity on the airlines.

Sincerely,

Robert D. Grace, D.C.

Robert D. Grace, D.C.

U.S. Department
of Transportation
**Federal Aviation
Administration**

800 Independence Ave., S.W.
Washington, D.C. 20591

FEB 25 1994

Joyce B. Hagan
115 Spalding Drive
Atlanta, Georgia 30328-1912

Dear Ms. Hagan;

This is in response to your fax dated November 19, 1993. We understand that you desire a total smoking ban for all Federal Aviation Administration (FAA) certificated carriers to include international flights. We also understand that you are a flight attendant who is frequently exposed to smoking on such flights. You have requested to receive a written statement of FAA's policy concerning smoking on international flights.

We are working with the International Civil Aviation Organization (ICAO) to develop an international standard on smoking. It is true that ICAO plans a ban effective in 1996. It is also true that each signatory to ICAO may document differences to the standard. At this time, there is no reason to think that FAA will oppose the ICAO initiative.

The FAA is not against a smoking ban. An ICAO initiative is desirable as it will have world-wide involvement. We considered this issue when we published the domestic smoking ban. That smoking ban was enacted as response to a public law issued by Congress. Congress did not include international flights in that law. The public law was issued prior to the Environment Protection Agency (EPA) report you refer to.

Working with the international community and ICAO is our current policy.

We trust we have answered your request.

Sincerely,

David S. Potter
for David R. Harrington
Manager, Air Transportation
Division
Flight Standards Service

Appendix 2

U.S. Department
of Transportation
Federal Aviation
Administration

Memorandum

Subject: INFORMATION: National Academy of Sciences Recommendations on Cabin Air Quality; Re: Recom. 20, Does FAA Have Responsibility/Authority for Cabin Attendant Health?

Date: OCT 20 1986

From: Manager, General Law Branch, AGC-110

Reply to Attn of: WALSH:267-3362

To: Director, Office of Aviation Medicine, AAM-1

> "The committee recommends that FAA establish a program to monitor selected health effects on airliner crews"

Some question has been raised about the FAA's authority to deal with this recommendation. In a Federal Register Notice, dated July 10, 1975, the agency asserted that-

> Every factor affecting the safe and healthy working conditions of aircraft crew members involves matters inseparably related to the FAA's occupational safety and health responsibilities under the [Federal Aviation] Act. With respect to civil aircraft in operation, the overall FAA regulatory program, outlined in part above, fully occupies and exhausts the field of aircraft crew member safety and health.

40 F.R. 29114.

The question was raised at a recent meeting as to whether Jonathan Howe, then ANM-2, rescinded this assertion in testimony before the Burton subcommittee at San Francisco, in 1980. My review of the hearing transcript satisfies me that he did not do so. In his prepared statement, Howe said-

> Because of the FAA's air safety mission and the pervasive regulatory scheme we have in place concerning aircraft design and operations, we have asserted full jurisdiction over health and safety requirements of aircraft in flight.

Hearing Transcript, 188.

In response to questioning, Howe reaffirmed the agency's position, as follows-

<u>Mr. Walker</u>. But the point is that on the one hand, FAA is making it very clear that you have full jurisdiction in health and safety requirements in aircraft [in] flight. That is not an area that you are going to concede to OSHA no matter what?

<u>Mr. Howe.</u> That is true. That is correct.

Hearing Transcript, 184.

The sum of the foregoing is, I believe, that we are still on record as asserting that we have authority to regulate concerning health hazards occurring in aircraft in operation, and that certain actions we have taken in the past constitute exercises of that authority. In assessing our position today, however, it is well to take account of the situation that gave rise to these pronouncements.

In the 1975 time frame we were, at the behest of OST, specifically TES-10, engaged in a "turf" battle with OSHA. Our FR Notice was prompted by that consideration more than any other. Under Section 4(b)(1) of the Occupational Safety and Health Act, OSHA was asserting its authority to regulate hazards left unattended by other agencies even though the other agency had statutory authority to regulate the hazard. For instance, OSHA representatives asserted in a meeting that they had, and would not hesitate to exercise, the authority to require airline pilots to wear parachutes. They argued that the only way for the FAA to prevent such an event would be for us to "exercise" our admitted authority over the matter, as by adopting a rule that declared parachutes unnecessary. This position was based on the fact that Section 4(b)(1) of the OSHAct, which operates to limit OSHA jurisdiction, requires that the ousting agency "exercise" its authority; merely having the authority is not enough.

The atmosphere today is significantly different. OSHA has no interest in regulating the aviation industry. As a result of the decision of the Occupational Safety and Health Review Commission in the Northwest Airlines case, OSHA lawyers have taken the position that there is, practically speaking, an industry exemption for the airline industry. Similarly, in a 1980 letter denying a research grant to study the effects of flying as an

occupation on the health of flight attendants, the Administrator of OSHA said-

> OSHA is unable to provide funding to study the working conditions of flight attendants [because] "Program activities involving workplaces that are largely precluded from enforcement action...under Section 4(b)(1)..." are nonsupportable under this program.

Letter to NIOSH, Jan 11,1980.

Thus, there is no need for us to overstate the extent of our authority merely to keep OSHA at bay. The question remains, however, whether our statute gives us the authority to regulate conditions affecting health alone, or whether there must be some connection with safety.

Whether we can "monitor" health effects as recommended when there is no connection with safety of flight appears on the surface of our statute to be questionable. In connection with that question, I have cursorily reviewed the notices and amendments involved with the "ozone rule," and with the smoking issue. The actions taken with regard to ozone appear to have been based exclusively on health considerations, especially in view of the fact that passenger comfort seems to have been a prime consideration for their adoption. Nevertheless, I do note that the actions required of the regulated persons affected by the rule involve either modification of the aircraft or changes in operational factors that could be considered safety-related and, therefore, within the exclusive purview of the FAA. In this connection, however, it cannot be overlooked that the FAA formally asserted authority to regulate smoking solely in the interest of passenger health, withdrawing from that action only because there was not sufficient evidence of adverse effects to support it, at that time. See, Notice 70-14, and the withdrawal of same.

Of further, and perhaps controlling, interest is the recent decision of the Court of Appeals for the D.C. Circuit in the medical kit case, Bargmann v. Helms. The court held in that case, despite our protestations to the contrary, that the FAA has the authority to require air carriers to carry medical kits aboard that are stocked with medicines and other materials necessary for the treatment of diseases and other ailments or infirmities among passengers which are not caused, or necessarily even aggravated, by flying.

Finally, I have found nothing to indicate that any other government agency may have jurisdiction over health issues arising from employment on aircraft in operation. It is worth noting, however, that any such authority, should it exist, would hardly exclude the FAA from concurrent jurisdiction over the same conditions.

In conclusion, in answer to the questions raised at the meeting with Tony Broderick, I believe we do have authority to regulate the health aspects of employment on aircraft in operation. There is not, however, any legal compulsion to exercise that authority in any particular manner as to any particular health hazard. As the court said in Bargmann v. Helms, " [w]e hold only that the agency has the power of decision [to require or not to require the expanded medical kits]; the decision itself must be made by the FAA." Whether we believe that OSHA's apparent abdication in this area imposes a moral or political obligation on the FAA is left to the judgment of others.

JOHN M WALSH

Modern Maturity

Clearing the air

Last month marked the second anniversary of a landmark in air travel: **Air Canada's total smoking ban** on all scheduled flights worldwide. Critics said it wouldn't work when Air Canada announced the plan in January 1991—but passenger reaction has been positive, according to the airline, and more customers have been gained than lost through the policy. AC says it has helped the bottom line in other ways, too: A million dollars has been saved just on flight cabin upkeep (washing walls, cleaning carpets, etc.) since passengers stopped puffing up the joint. —*C.N.B.*

Feb 93

Airline Division
Division du Transport Aérien
Canadian Union of Public Employees Syndicat canadien de la fonction publique

**NON-SMOKING PRESENTATION
TO THE SUBCOMMITTEE ON AVIATION
MAY 18, 1994**

**PRESENTED BY DONNA HENDRICK
PRESIDENT, AIRLINE DIVISION OF CUPE**

In 1985 Statistics Canada revealed that 500 Canadians die each year from the effects of "passive smoking". In 1985, Lynn McDonald, Member of Parliament, recognizing the mounting evidence that second-hand smoke in the workplace damages workers' health, introduced a Private Members' Bill: The Non-Smokers' Health Act, to protect workers in Crown corporations, transportation and communications industries.

The airlines began to respond to the growing public awareness of the negative effects of second-hand smoke. In 1971 Air Canada offered passengers a choice of smoking or non-smoking seats on all aircraft. After more than 200 passenger complaint letters in 1985, and as a competitive marketing strategy based on the results of passenger research conducted on its Montreal-Ottawa-Toronto high-volume triangle route, Air Canada decided to offer non-smoking on flights up to 1:10 hours, for a three-month trial period. Passengers not only supported these non-smoking flights; they requested more of these flights, especially ones of longer duration.

This action by Air Canada prompted the federal government in 1986 to announce a smoking ban on Canadian flights of two hours or less. Although the airline carriers had been encouraged by the government to initiate voluntary action, this was rejected because voluntary compliance and voluntary initiatives are not enforceable and can be abandoned at any time. By April 1988 both Air Canada and Canadian Airlines International had voluntarily become totally smoke-free on flights under six hours within North America. Although both air carriers had been operating in North America smoke-free successfully for one year, the government enacted legislation in 1989.

In June 1990 Canadian air carriers were required to reduce smoking rows by 25% until aircraft cabins were entirely non-smoking by July 1, 1993. In October 1990, Air Canada introduced non-smoking flights to Europe, and this air carrier has been totally non-smoking for almost four years. Air Canada strongly supported Transport Canada's decision to request that member states of The Council of the International Civil Aviation Organization and World Health Organization consider a resolution leading to the eventual elimination of smoking on all international flights by July 1, 1996. The air carriers have twice requested and received an extension to the implementation of a total smoking ban; consequently the Act allows smoking on Asian flights. This extension is scheduled to terminate on July 1, 1994. After four extensions to a total smoking ban, the Airline Division of CUPE will mount a major public campaign to compel the government to follow through with its commitment to airline workers.

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Donna Hendrick
Division President
Présidente de la Division

Denise Hill
Division Vice President
Vice Présidente de la Division

Diane Stead Hogarth
Division Secretary Treasurer
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There have been significant economic savings for the airline companies, as well as health and safety benefits for crews and passengers. Air Canada has shown in the first quarter of 1991 that it saved $800,000. in dry cleaning of drapes and shampooing of carpets on aircraft. As well, the smoking ban on flights has improved the air quality on aircraft and has reduced the potential health hazard to crew and passengers.

One of the most serious results of smoking is a safety concern: when a passenger lights a cigarette on a totally non-smoking flight, it can be smelled immediately, thereby preventing the possibility of an onboard fire.

Smoking has been condemned by the medical profession as a serious health hazard; second-hand smoke is recognized as a serious threat to non-smokers; and airline carriers can save substantial costs with a non-smoking ban. The world airlines and their related associations are gradually moving towards a greater number of non-smoking flights. It is time for the government to enact legislation that protects the lungs of humans in a small, compressed area, such as an aircraft.

:gw
opeiu:491

Airline Division
Division du Transport Aérien
Canadian Union of Public Employees Syndicat canadien de la fonction publique

**AIR QUALITY PRESENTATION
TO THE SUBCOMMITTEE ON AVIATION
MAY 18, 1994**

**PRESENTED BY DONNA HENDRICK
PRESIDENT, AIRLINE DIVISION OF CUPE**

The problem of poor air quality on aircraft has been a long-standing concern of the Airline Division of CUPE because this issue has serious health consequences for flight attendants and the travelling public. As a result of numerous complaints from flight attendants, the Canadian Aviation Board on March 14, 1990, issued an Aviation Safety Advisory #1388 proposing to assess the quality of cabin air on several aircraft types operating at high altitudes, and to determine the effects on the ability of flight attendants to perform safety-related duties. On June 18, 1990, Transport Canada responded to this Advisory and agreed to do a one-year testing program of 12 aircraft types. The first aircrafts to be studied would be the A320 and the B767.

The premise of this joint Transport Canada/Labour Canada study was based on a preliminary Transport Canada investigation of the F-100 in 1989, which found unacceptable levels of on-board carbon dioxide that could be harmful to humans and create "a significant problem". Based on the results of this early inquiry, it became clear that the cabin air quality standards contained within the Aviation Occupational Safety and Health Regulations were inadequate, because the limits of exposure to toxins were set too high. A comprehensive study of all aircrafts could correct this regulatory deficiency and provide scientific evidence to allow the federal government to set appropriate standards to protect the health of flight attendants and passengers. More importantly, these new standards would establish a scientific basis to monitor future air quality problems.

While this national cabin air quality study was acceptable to our union and the aircraft manufacturers, it was rejected by the airline carriers and Transport Canada in January 1992. Instead, air quality tests were conducted as a result of specific complaints and only "to confirm published air quality standards".

This "solution" is unacceptable. The F-100 air quality tests had already shown that on-board concentrations of toxins were in excess of acceptable levels, while at the same time in compliance with "published air quality standards". Consequently, any government investigation of flight attendant complaints would only prove that dangerous and hazardous cabin air quality conditions still exist within Transport Canada standards. Because the standards were set too low, any complaints could be dismissed by the air carriers and Transport Canada, despite health risks faced by flight attendants and passengers.

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In December 1992, the Airline Division of CUPE conducted a cabin air quality survey. Slightly more than 70 per cent of all respondents reported having problems. From written comments, it was clear that many respondents accepted poor cabin air quality as **NORMAL** and not worth reporting. (This attitude has dramatically changed in the last 5 months.) Therefore, the survey results are conservative and understate the actual level of cabin air quality problems experienced by flight attendants. Detrimental symptoms were reported by flight attendants of all ages, seniority groups, and both male and female workers.

Some of the more serious symptoms reported by flight attendants were: sudden fatigue, 80 per cent of the respondents reported moderate to severe conditions, 76 per cent reported moderate to severe headaches, and other symptoms include respiratory pain, dizziness, shortness of breath, and faintness. 24 Per cent of all respondents reported having to take oxygen on board from the portable bottles, and 5 Per cent of respondents missed at least one day of work as a result of symptoms related to the problem of air quality.

Our survey results show that the A320 seems to be the worst culprit, with the B767 and the DC10, following closely behind.

It was also noted that 90 per cent of pilots did not address the air quality concerns of flight attendants. Because of the increased economic pressure on the carriers to cut costs, pilots are turning air packs off or decreasing the amount of fresh air to save fuel.

We firmly believe that a comprehensive air quality study conducted in Canada or in the United States, would conclusively confirm our survey results, and consequently, these findings could significantly improve air quality standards for airline workers (flight attendants) and the travelling public.

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opeiu:491

LIAISON

Bulletin No. 8

January - 1990

OCCUPATIONAL SAFETY AND HEALTH IN THE FEDERAL JURISDICTION

This periodic bulletin reports on developments in occupational safety and health under federal jurisdiction, and particularly notes regulatory changes generated by labour-management working groups set up by the Review Committee for Technical Revisions to the Canada Occupational Safety and Health (OSH) Regulations (Review Committee). General inquiries on bulletin items can be directed to Legislative Development and Liaison, Occupational Safety and Health Branch, Labour Canada, Ottawa, Ontario KIA 0J2. Phone: (819) 997-2400; Facsimile: (819) 997-1664; Telex: (819) 997-3453.

HIGHLIGHT

Non-smokers' Health Regulations

The Non-smokers' Health Regulations (SOR/90-21) were published in Part II of the Canada Gazette on January 3, 1990. An amendment to these regulations (SOR/90-70) deferring a smoking ban on certain flights to July 1, 1990, was published in Part II of the Canada Gazette on January 5, 1990. A copy of the regulations and of the amendments are attached to this Bulletin.

The regulations prescribe the standards which must be met in establishing designated smoking rooms and areas. They also prohibit smoking on domestic and international flights except on entity charters. The admendment provides a transition period of six months (i.e. until June 30, 1990) before the prohibition on smoking on flights of more than six hours comes into effect. Smoking is also prohibited on all intercity bus operations as well as on trains with fewer than three cars.

65%
TWO-SIDED

Copies of these regulations are available from the Canadian Government Publishing Centre, Supply and Services Canada, Ottawa, Ontario, K1A 0S9 Phone: (819) 997-2560

OTHER ITEMS

Office Consolidation of Part II of the Canada Labour Code

Delays in the Department of Justice in assembling the text will result in an office consolidation version of Part II of the Canada Labour Code not being available before March or April 1990 at the earliest.

Review of Part II of the Canada Labour Code

Please advise Legislative Development and Liaison by the end of January 1990 about problems or inconsistencies in the wording of the new Part II. Labour Canada will be proposing miscellaneous minor amendments later in 1990. Minor amendments may also result from other legislative initiatives. Labour Canada does not expect to initiate discussions on major issues before October 1990 at the earliest.

Proposed Amendments to Part VII (Levels of Sound) of the Canada OSH Regulations

These proposed amendments are now expected to be prepublished in Part I of the Canada Gazette for final comment in mid-February 1990.

Amendments to Part XI (Confined Spaces) of the Canada OSH Regulations

Amendments are still being discussed at the Working Group Level. They may be ready for consideration by the Review Committee at their February meeting.

Amendments to Part X (Hazardous Substances) of the Canada OSH Regulations

These are still being discussed at the Working Group level. Next meeting is scheduled for mid-February 1990.

Amendments to Part II (Building Safety) and Part XIV (Materials Handling) of the Canada OSH Regulations

These are the next priorities for revisions of the Canada OSH Regulations. Labour Canada is awaiting position papers from employers and employees.

Coal Mining Safety Commission Regulations, Amendments to Coal Mines (CBDC) Safety Regulations and Consequential Amendments to Parts X and XV of the Canada OSH Regulations

These regulations, applying to the coal mines of the Cape Breton Development Corporation, are being finalized and it is anticipated that they will be published in Part II of the Canada Gazette in mid-February 1990.

Employee Assistance Program

A survey is currently being conducted of unions in the federal jurisdiction, equivalent to the survey previously done of employers. It is anticipated that consultation meetings with employer and employee representatives will be held in March 1990 to review the recommendations to be made in this area.

LIAISON

Bulletin N° 8

Janvier 1990

LA SÉCURITÉ ET LA SANTÉ AU TRAVAIL DANS LES SECTEURS DE COMPÉTENCE FÉDÉRALE

Le présent bulletin fait état des activités relatives à la sécurité et la santé au travail dans les secteurs de compétence fédérale et signale, en particulier, les modifications proposées par les groupes de travail patronaux-syndicaux qui sont établis par le Comité d'examen des révisions techniques du Règlement du Canada sur la sécurité et la santé au travail (Comité d'examen). Pour les demandes de renseignements généraux concernant les articles publiés dans le bulletin on peut s'adresser à: Élaboration des normes juridiques et Liaison, Direction de la sécurité et de la santé au travail, Travail Canada, Ottawa (Ontario) KIA 0J2. Téléphone: (819) 997-2400; fac-similé: (819) 997-1664; télex: (819) 997-3453.

FAIT SAILLANT

Les Règlements sur la santé des non-fumeurs

Les Règlements sur la santé des non-fumeurs (DORS/90-21) est paru dans la partie II de la Gazette du Canada le 3 janvier 1990. Une modification de ces règlements (DORS/90-70), reportant au 1er juillet 1990 l'interdiction de fumer sur certains vols, a été publiée dans la partie II de la Gazette du Canada le 5 janvier 1990. Un exemplaire des règlements et un exemplaire des modifications sont annexés au présent Bulletin.

Les règlements fixent les normes à respecter pour l'établissement des fumoirs et des zones fumeurs. Il interdit également de fumer sur les vols intérieurs et internationaux, sauf dans le cas des affrètements sans participation. La modification prévoit une période de transition de six mois (c.-à-d. jusqu'au 30 juin 1990) avant l'entrée en vigueur de l'interdiction de fumer sur les vols de plus de six heures. En outre, il est interdit de fumer dans tous les autobus interurbains ainsi que dans les trains comptant moins de trois voitures.

T40-S1050

On peut obtenir des exemplaires de ces règlements en s'adressant au Centre d'édition du gouvernement du Canada, Approvisionnements et services Canada, Ottawa (Ontario), KIA 0S9, teléphone (819) 997- 2560.

AUTRES QUESTIONS

Codification administrative de la partie II du Code canadien du travail

Comme le ministère de la Justice n'a pu assembler à temps le texte, la codification administrative de la partie II du Code canadien du travail ne sera pas disponible avant mars ou avril 1990 au plus tôt.

Revue de la partie II du Code canadien du travail

Veuillez informer Élaboration des normes juridiques et liaison avant la fin de janvier 1990 des problèmes ou incompatibilités dans le nouveau texte de la partie II. Travail Canada proposera diverses révisions mineures plus tard en 1990. Des modifications mineures pourraient également être apportées par suite d'autres initiatives législatives. Travail Canada ne s'attend pas à entamer des discussions sur des questions importantes avant octobre 1990 au plus tôt.

Modifications proposées à la partie VII à (Niveaux acoustiques) des Règlements du Canada sur la sécurité et la santé au travail

Ces modifications proposées devraient maintenant faire l'objet d'une publication préalable dans la partie I de la Gazette du Canada pour que le public puisse formuler des observations finales à la mi-février 1990.

Modifications à la partie XI (Espaces clos) des Règlements du Canada sur la sécurité et la santé au travail

Les modifications sont encore discutées au niveau du groupe de travail. Elles pourraient être prêtes à être examinées par le Comité d'examen au cours de la réunion de février.

Modifications à la partie X (Substances dangereuses) des Règlements du Canada sur la sécurité et la santé au travail

Ces modifications font encore l'objet de discussions au niveau du groupe de travail. La prochaine réunion est prévue pour la mi- février 1990.

Modifications à la partie II (Sécurité des bâtiments) et à la partie XIV (Manutention et entreposage des matériaux) des Règlements du Canada sur la sécurité et la santé au travail

Il s'agit des prochaines révisions à apporter en priorité aux Règlements du Canada sur la sécurité et la santé au travail. Travail Canada attend de recevoir les exposés de position des employeurs et employés.

Règlements sur la Commission de la sécurité dans les mines de charbon, modifications aux Règlements sur la sécurité dans les mines de charbon (SDCB) et modifications corrélatives aux parties X et XV des Règlements du Canada sur la sécurité et la santé au travail

Les derniers détails de ces règlements, qui s'appliquent aux mines de charbon de la Société de développement du Cap-Breton, sont mis au point, et il est prévu qu'ils seront publiés dans la partie II de la Gazette du Canada à la mi-février 1990.

Programmes d'aide aux employés

Une enquête semblable à celle effectuée auprès des employeurs est menée à l'heure actuelle auprès des syndicats qui relèvent de la compétence fédérale. Il est prévu de tenir, en mars 1990, des réunions de consultation avec les représentants des employeurs et employés pour examiner les recommandations à formuler dans ce domaine.

EXTRA No. 1, Vol. 124

Canada Gazette
Part II

OTTAWA, FRIDAY, JANUARY 5, 1990

Registration
SOR/90-70 28 December, 1989

NON-SMOKERS' HEALTH ACT

Non-smokers' Health Regulations, amendment

P.C. 1989-2614 28 December, 1989

Her Excellency the Governor General in Council, on the recommendation of the Minister of Transport, pursuant to subsection 7(1)* of the Non-smokers' Health Act** is pleased hereby to amend the Non-smokers' Health Regulations, made by Order in Council P.C. 1989-2463 of December 14, 1989***, in accordance with the schedule hereto, effective on the date of the coming into force of the said Act.

SCHEDULE

1. The *Non-smokers' Health Regulations* are amended by adding thereto, immediately after section 13 thereof, the following section:

"13.1 (1) An employer who operates an aircraft for hire or reward on an international flight may designate any area of the aircraft or all of the aircraft as a designated smoking area in respect of

(a) any segment of the flight between Canada and a point outside Canada that has a scheduled duration of more than six hours

* S.C. [illegible]
** R.S., [illegible] (4th Supp.)
*** SOR/90-21, 1990 *Canada Gazette* Part II, p. 121

ÉDITION SPÉCIALE N° 1, Vol. 124

Gazette du Canada
Partie II

OTTAWA, LE VENDREDI 5 JANVIER 1990

Enregistrement
DORS/90-70 28 décembre 1989

LOI SUR LA SANTÉ DES NON-FUMEURS

Règlement sur la santé des non-fumeurs—Modification

C.P. 1989-2614 28 décembre 1989

Sur avis conforme du ministre des Transports et en vertu du paragraphe 7(1)* de la Loi sur la santé des non-fumeurs** et à compter de la date d'entrée en vigueur de cette loi, il plaît à Son Excellence le Gouverneur général en conseil de modifier conformément à l'annexe ci-après, le Règlement sur la santé des non-fumeurs, pris par le décret C.P. 1989-2463 du 14 décembre 1989***.

ANNEXE

1. Le *Règlement sur la santé des non-fumeurs* est modifié par insertion, après l'article 13, de ce qui suit:

«13.1 (1) L'employeur qui exploite un aéronef à titre onéreux sur un vol international peut désigner comme zone fumeurs tout ou partie de l'aéronef dans les cas suivants:

a) tout segment de vol entre le Canada et un point situé dans un autre pays d'une durée prévue de plus de six heures;

* L.C. [illegible]
** L.R., ch. [illegible] (4e suppl.)
*** DORS/90-21, *Gazette du Canada* Partie II, 1990, p. 121

(b) any segment of the flight that takes place wholly outside of Canada; or

(c) any segment of the flight that takes place wholly within Canada if

(i) the flight originated outside Canada,

(ii) the only passengers on board the aircraft are those who boarded the aircraft outside Canada, and

(iii) smoking was permitted on board the aircraft during the immediately preceding segment of the flight.

(2) This section shall continue in force until June 30, 1990."

b) tout segment de vol à l'extérieur du Canada;

c) tout segment de vol à l'intérieur du Canada, lorsque sont réunies les conditions suivantes :

(i) le vol a commencé à l'extérieur du Canada,

(ii) tous les passagers à bord de l'aéronef y sont montés à l'extérieur du Canada,

(iii) il était permis de fumer à bord de l'aéronef au cours du segment de vol précédent.

(2) Le présent article cesse d'être en vigueur le 30 juin 1990. »

REGULATORY IMPACT ANALYSIS STATEMENT

(This statement is not part of the Regulations.)

Description

The *Non-smokers' Health Act* and regulations made thereunder regulate smoking on commercial flights by Canadian air carriers. This amendment allows these air carriers to designate smoking areas on board aircraft for international flights that have a duration of longer than six hours. The amendment will cease to be in effect on July 1, 1990 and after this date smoking will not be allowed on such flights.

Alternatives Considered

The only alternative considered was not to amend the existing regulations which would result in a total smoking ban on such flights. It was decided that the amendment was necessary in order to give airlines and their passengers time to make an orderly transition to a total ban on smoking on international flights.

Consistency with Regulatory Policy and Citizens' Code

This regulation provides a six month period before the ban on smoking on international flights of longer than six hours comes into effect and provides a means of ensuring an orderly transition for Canadian air carriers.

Anticipated Impact

The impact of smoking and second hand smoke on health and the economic impacts of a ban on smoking were discussed in the Regulatory Impact Analysis Statement for the *Non-smokers' Health Regulations* published on January 3, 1990. This amendment will have a positive impact on the industry by allowing air carriers and passengers to arrange their affairs to accommodate the total ban on smoking on international flights of Canadian air carriers which will come into effect on July 1, 1990.

RÉSUMÉ DE L'ÉTUDE D'IMPACT DE LA RÉGLEMENTATION

(Ce résumé ne fait pas partie du règlement.)

Description

La *Loi sur la santé des non-fumeurs* et le règlement qui en découle régissent l'usage du tabac au cours des vols commerciaux effectués par les transporteurs aériens canadiens. La présente modification permet à ces transporteurs aériens de désigner des zones fumeurs à bord d'un aéronef qui effectue un vol international d'une durée de plus de six heures. La modification est en vigueur jusqu'au 1[er] juillet 1990, date à compter de laquelle il sera interdit de fumer au cours de vols internationaux.

Solutions de rechange envisagées

La seule solution de rechange envisagée aurait été de ne pas modifier le règlement en vigueur, ce qui entraînerait l'interdiction totale de fumer au cours des vols en question. Il a été jugé nécessaire de modifier le règlement afin d'accorder aux transporteurs aériens et à leurs passagers une période transitoire avant l'interdiction totale de fumer au cours de vols internationaux.

Compatibilité avec la Politique de réglementation et le Code du citoyen

La modification accorde une période de six mois avant la mise en vigueur de l'interdiction de fumer au cours d'un vol international d'une durée de plus de six heures. Elle accorde également une période transitoire aux transporteurs aériens canadiens.

Répercussions prévues

La mise en vigueur de la modification aura des répercussions positives sur le transport aérien. Elle permettra aux transporteurs aériens et à leurs passagers d'agir en prévision de l'interdiction totale de fumer au cours des vols internationaux effectués par les transporteurs aériens canadiens, interdiction qui entrera en vigueur le 1[er] juillet 1990.

Consultation

While no formal consultation was undertaken concerning the amendment, comments relating to smoking on international flights were received as part of the consultation process for the *Non-smokers' Health Regulations*.

Compliance Mechanism

The regulations will be enforced in the same way as the other provisions of the *Non-smokers' Health Regulations*. They are self-regulating in the sense that employers will be expected to ensure compliance in their workplace and both employers and employees have responsibilities under the Act with regard to passengers who smoke outside designated areas. Provision is also made in the Act for inspectors or peace officers to issue a ticket to those who contravene the Act or regulations.

For further information, contact:

Grant Mazowita
Director
Enforcement and Legislation
Transport Canada
Ottawa, Ontario
K1A 0N8
(613) 990-1224

Consultation

La modification n'a pas fait l'objet d'une consultation officielle. Cependant, des commentaires ont été émis concernant l'usage du tabac au cours de vols internationaux pendant le processus de consultation pour la prise du *Règlement sur la santé des non-fumeurs*.

Mécanisme de conformité

La mise en application de la modification sera assurée de même façon que la mise en application des autres dispositions du *Règlement sur la santé des non-fumeurs*. Le règlement est autonome, car les employeurs devront en assurer le respect dans leurs lieux de travail. En vertu de la loi, les employeurs et les employés sont tenus de veiller à ce que les passagers ne fument que dans les zones fumeurs désignées. La loi prévoit également que les inspecteurs ou les agents de la paix pourront remettre des procès-verbaux de contravention pour infraction à la loi ou au règlement.

Pour de plus amples renseignements, veuillez communiquer avec :

Grant Mazowita
Directeur
Législation et application des règlements
Transports Canada
Ottawa (Ontario)
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Extract
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DEPARTMENT OF LABOUR

MINISTÈRE DU TRAVAIL

Non-smokers' Health Regulations

Règlement sur la santé des non-fumeurs

Registration
SOR/90-21 14 December, 1989

NON-SMOKERS' HEALTH ACT

Non-smokers' Health Regulations

P.C. 1989-2463 14 December, 1989

Her Excellency the Governor General in Council, on the recommendation of the Minister of Labour and the Minister of Transport, pursuant to subsection 7(1)* of the Non-smokers' Health Act**, is pleased hereby to make the annexed Regulations respecting the health of non-smokers, as of the date of the coming into force of the said Act.

REGULATIONS RESPECTING THE HEALTH OF NON-SMOKERS

Short Title

1. These Regulations may be cited as the *Non-smokers' Health Regulations*.

Interpretation

2. In these Regulations,

"Act" means the *Non-smokers' Health Act*; (*Loi*)

"ASHRAE" means the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; (*ASHRAE*)

"entity charter" means a charter contract under which the cost of transportation of all passengers is paid by one person, company or organization and no charge or other financial obligation is imposed on a passenger as a condition of carriage or otherwise in connection with the transportation; (*affrètement sans participation*)

"living accommodation" means separate living or sleeping quarters set aside by an employer for the accommodation of persons at a work place. (*local d'habitation*)

Designated Smoking Rooms and Designated Smoking Areas

3. (1) An employer may designate as a designated smoking room any room in a work space under the control of the employer other than a private office if the room is

(*a*) enclosed by walls, a floor and a ceiling;

(*b*) clearly identified as a designated smoking room by a sign that meets the requirements set out in subsection 6(2);

(*c*) subject to subsection (2), ventilated in accordance with ASHRAE Standard 62-1989, *Ventilation for Acceptable Indoor Air Quality*; and

(*d*) equipped with ashtrays or non-combustible covered receptacles for the disposal of waste.

* S.C. 1989, c. 7, s. 1
** R.S., c. 15 (4th Supp.)

Enregistrement
DORS/90-21 14 décembre 1989

LOI SUR LA SANTÉ DES NON-FUMEURS

Règlement sur la santé des non-fumeurs

C.P. 1989-2463 14 décembre 1989

Sur avis conforme du ministre du Travail et du ministre des Transports et en vertu du paragraphe 7(1)* de la Loi sur la santé des non-fumeurs** et à compter de la date d'entrée en vigueur de cette loi, il plaît à Son Excellence le Gouverneur général en conseil de prendre le Règlement concernant la santé des non-fumeurs, ci-après.

RÈGLEMENT CONCERNANT LA SANTÉ DES NON-FUMEURS

Titre abrégé

1. *Règlement sur la santé des non-fumeurs*.

Définitions

2. Les définitions qui suivent s'appliquent au présent règlement.

«affrètement sans participation» Contrat d'affrètement aux termes duquel le coût du transport de tous les passagers est payé par une seule personne, une seule société ou un seul organisme et aucuns frais, ni autre obligation financière ne sont imposés aux passagers comme condition de transport ou autrement pour le voyage. (*entity charter*)

«ASHRAE» Sigle désignant l'American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (*ASHRAE*)

«local d'habitation» Pièce distincte d'habitation ou de couchage que l'employeur réserve au logement des personnes dans un lieu de travail. (*living accomodation*)

«Loi» La *Loi sur la santé des non-fumeurs*. (*Act*)

Fumoirs et zones fumeurs

3. (1) L'employeur peut désigner comme fumoir une pièce du lieu de travail placé sous son autorité, à l'exception d'un bureau privé, à condition que la pièce soit à la fois

a) fermée par un plancher, un plafond et des murs;

b) clairement indiquée comme fumoir au moyen d'une affiche conforme au paragraphe 6(2);

c) sous réserve du paragraphe (2), ventilée au moyen d'un système de ventilation, conformément à la norme ASHRAE 62-1989 intitulée *Ventilation for Acceptable Indoor Air Quality*;

* L.C. 1989, ch. 7, art. 1
** L.R., ch. 15 (4e suppl.)

(2) The ventilation in a designated smoking room shall exhaust the air to the outside and shall not re-circulate the air within any work space.

(3) Paragraph (1)(c) and subsection (2) do not apply to designated smoking rooms on trains and ships.

4. Notwithstanding section 3, an employer may designate the following rooms or areas in a work space under the control of the employer as designated smoking rooms or designated smoking areas:

(a) any living accommodation;

(b) any motor vehicle, lighthouse, crane cab, caboose, locomotive or other room or area in the work space

(i) that is not incorporated within any other work space,

(ii) that does not share a ventilation system with any other work space, and

(iii) to which only one person normally has access during a shift; and

(c) any room on a ship to which only one person normally has access during a shift.

5. (1) Every employer shall ensure that all designated smoking areas in a work space under the employer's control are

(a) equipped with ashtrays or non-combustible covered receptacles for the disposal of wastes; and

(b) identified as a designated smoking area by a sign that meets the requirements set out in subsection 6(2) and is clearly visible to any person who approaches the area.

(2) Paragraph (1)(b) does not apply in respect of a room or area described in paragraph 4(b) or (c).

Notice of Smoking Restrictions

6. (1) Every employer shall, by notice in writing or by posting clearly visible signs, inform all employees in a work space under the control of the employer

(a) that smoking is prohibited in all work spaces except in designated smoking rooms and designated smoking areas, if any; and

(b) of the location of all such rooms and areas.

(2) The signs referred to in subsection (1) shall be

(a) in writing; or

(b) substantially in the form of an appropriate symbol depicted in Schedule I, in the applicable colours referred to in that Schedule.

7. (1) Subject to subsection (2), where an employer is in control of a work space to which the public is admitted, the employer shall, by means of a clearly visible sign that meets the requirements set out in subsection 6(2) and that is posted at each entrance to the work space used by the public, inform the members of the public who enter the work space that, depending on the case,

(a) smoking is prohibited in the work space; or

d) munie de cendriers ou de récipients couverts et incombustibles pour recevoir les déchets.

(2) Le système de ventilation d'un fumoir doit faire évacuer l'air vers l'extérieur sans le faire recirculer à l'intérieur de tout lieu de travail.

(3) L'alinéa (1)c) et le paragraphe (2) ne s'appliquent pas aux fumoirs à bord des trains et des navires.

4. Par dérogation à l'article 3, l'employeur peut, dans le lieu de travail placé sous son autorité, désigner comme fumoir ou zone fumeurs les pièces ou aires suivantes :

a) un local d'habitation;

b) un véhicule moteur, un phare, une cabine de grue, un fourgon de queue, une locomotive ou autre pièce ou aire du lieu de travail qui répond aux conditions suivantes :

(i) elle n'est incorporée dans aucun lieu de travail,

(ii) elle a un système de ventilation distinct de tout autre lieu de travail,

(iii) une seule personne y a normalement accès au cours d'un quart;

c) une pièce d'un navire à laquelle une seule personne a normalement accès durant un quart.

5. (1) L'employeur doit s'assurer que les zones fumeurs dans le lieu de travail placé sous son autorité sont à la fois :

a) munies de cendriers ou de récipients couverts et incombustibles pour recevoir les déchets;

b) indiquées comme telles au moyen d'une affiche conforme au paragraphe 6(2) et bien visible à quiconque s'approche de la zone.

(2) L'alinéa (1)b) ne s'applique pas à une pièce ou aire visée à l'alinéa 4b) ou c).

Avis d'interdiction de fumer

6. (1) Dans tout lieu de travail placé sous son autorité, l'employeur doit, au moyen soit d'avis écrits, soit d'affiches clairement visibles, informer les employés :

a) d'une part, de l'interdiction de fumer dans le lieu de travail, à l'exception des fumoirs et des zones fumeurs, le cas échéant;

b) d'autre part, de l'emplacement des fumoirs et des zones fumeurs.

(2) Les affiches visées au paragraphe (1) sont :

a) soit sous forme d'un texte;

b) soit sous forme d'une reproduction essentiellement semblable au symbole voulu qui apparaît à l'annexe I, dans les couleurs applicables indiquées à cette annexe.

7. (1) Sous réserve du paragraphe (2), lorsque le public est admis dans le lieu de travail placé sous l'autorité de l'employeur, ce dernier doit, au moyen d'une affiche clairement visible et conforme au paragraphe 6(2) placée à chaque entrée du lieu de travail, informer le public, selon le cas :

a) qu'il est interdit d'y fumer;

b) qu'il n'est permis d'y fumer que dans les fumoirs ou les zones fumeurs.

(*b*) smoking is permitted in the work space only in designated smoking rooms or designated smoking areas.

(2) Where the work space referred to in subsection (1) is an aircraft, the employer shall orally inform all persons on board the aircraft that, depending on the case,

(*a*) smoking is prohibited on the aircraft; or

(*b*) smoking is permitted on the aircraft only in designated smoking areas

Trains

8. An employer who operates a train that carries passengers may designate any bedroom, roomette or drawing room on a sleeping car or baggage crew car of the train as a designated smoking room.

9 (1) For the purposes of this section,

"corridor service" means a class of rail passenger transportation service provided at least once a day that links major cities between Quebec City and Windsor; (*service du corridor*)

"regional service" means a class of rail passenger transportation service linking small communities to one another or to major cities that provides at least three departures per week with many local stops; (*service régional*)

"remote service" means a class of rail passenger transportation service providing rail access to small communities in remote areas that have no other year-round means of transport for at least a portion of the route served; (*desserte de localités éloignées*)

"tourism service" means a class of rail passenger transportation service provided on a seasonal basis that is primarily marketed as a tourist attraction; (*service touristique*)

"transcontinental service" means a class of rail passenger transportation service providing a connection between Halifax and Montreal with six departures per week and between Toronto and Vancouver with three departures per week. (*service transcontinental*)

(2) An employer who operates a train used in providing a corridor service, regional service, remote service, tourism service or transcontinental service may designate any passenger seating area as a designated smoking area provided that

(*a*) not more that one third of the passenger seating accommodation on the train is so designated; and

(*b*) the passenger seating accommodation that is so designated is located on not more than one third of the passenger cars of the train.

Ships

10. An employer who operates a ship may designate any area on the ship that is used by employees for leisure or recreational activities as a designated smoking area.

(2) Lorsque le lieu de travail visé au paragraphe (1) est un aéronef, l'employeur informe oralement les personnes qui se trouvent à bord de l'aéronef, selon le cas

a) qu'il est interdit d'y fumer;

b) qu'il n'est permis d'y fumer que dans les zones fumeurs.

Trains

8. L'employeur qui exploite un train de voyageurs peut désigner comme fumoir une chambre, une chambrette ou un salon-lits d'une voiture-lits ou d'un fourgon à bagages et dortoir de l'équipage du train.

9. (1) Les définitions qui suivent s'appliquent au présent article.

«desserte de localités éloignées» Catégorie de service de transport de voyageurs par train qui assure l'accès à de petites localités éloignées qui, pour au moins une partie du trajet emprunté, ne disposent pas d'autres moyens permanents de transport. (*remote service*)

«service du corridor» Catégorie de service de transport de voyageurs par train assuré au moins une fois par jour entre de grandes villes situées entre Québec et Windsor. (*corridor service*)

«service régional» Catégorie de service de transport de voyageurs par train qui relie de petites localités entre elles ou à de grandes villes à raison d'au moins trois départs par semaine et qui comprend de nombreux arrêts locaux. (*regional service*)

«service touristique» Catégorie de service saisonnier de transport de voyageurs par train qui est principalement commercialisé en tant qu'attraction touristique. (*tourism service*)

«service transcontinental» Catégorie de service de transport de voyageurs par train qui assure la liaison entre Halifax et Montréal à raison de six départs par semaine et entre Toronto et Vancouver à raison de trois départs par semaine. (*transcontinental service*)

(2) L'employeur qui exploite un train affecté au service du corridor, au service régional, à la desserte de localités éloignées, au service touristique ou au service transcontinental peut y désigner des places assises pour voyageurs comme zone fumeurs à condition :

a) d'une part, qu'au plus un tiers des places assises pour voyageurs dans le train soient ainsi désignées;

b) d'autre part, que les places assises pour voyageurs ainsi désignées se trouvent dans au plus un tiers des voitures de voyageurs du train.

Navires

10. L'employeur qui exploite un navire peut désigner comme zone fumeurs une zone du navire servant aux activités de loisirs des employés.

11. An employer who operates a passenger ship may

(a) designate any passenger cabin on the ship as a designated smoking room; and

(b) designate any area intended for the use of passengers on the ship, other than a passenger cabin, as a designated smoking area, if the total surface area of all areas so designated does not exceed 30 per cent of the total surface area of all enclosed areas on the ship that are intended for the use of passengers.

Aircraft

12. An employer who operates an aircraft for the transportation of passengers under an entity charter may designate any area on the aircraft or all of the aircraft as a designated smoking area.

13. An employer who operates an aircraft that is registered as a private aircraft may, for any flight of the aircraft, designate any area on the aircraft or all of the aircraft as a designated smoking area.

Terminals

14. An employer who is in control of an airport passenger terminal or a marine passenger terminal may designate any interior portion of the terminal to which the public is admitted as a designated smoking area if the total surface area of the portions so designated does not exceed 30 per cent of the total surface area of all interior portions of the terminal to which the public is admitted.

Stations

15. An employer who is in control of a railway passenger station or an interurban bus station may designate any interior portion of the station to which the public is admitted as a designated smoking area if

(a) the total surface area of all interior portions to which the public is admitted is not less than 112 m²; and

(b) the total surface area of the portions so designated does not exceed 30 per cent of the total surface area of all interior portions to which the public is admitted.

Fines

16. The fine payable in proceedings under section 14 of the Act for an offence under a provision of the Act set out in column I of an item of Schedule II is the applicable fine set out in column II of that item.

Tickets

17. For the purposes of section 14 of the Act, a ticket shall be substantially in the form set out in Schedule III.

Informations

18. For the purposes of section 14 of the Act, an information shall be substantially in the form set out in Schedule III.

11. L'employeur qui exploite un navire de passagers peut

a) désigner comme fumoir toute cabine de passagers du navire;

b) désigner comme zone fumeurs toute zone du navire destinée à l'usage des passagers pourvu que la surface totale des zones ainsi désignées ne représente pas plus de 30 pour cent de la surface totale de toutes les zones fermées du navire destinées à l'usage des passagers, à l'exclusion des cabines de passagers.

Aéronefs

12. L'employeur qui exploite un aéronef affecté au transport des passagers aux termes d'un contrat d'affrètement sans participation peut désigner comme zone fumeurs tout ou partie de l'aéronef.

13. L'employeur qui exploite un aéronef immatriculé comme aéronef privé peut, pour la durée de tout vol de cet aéronef, désigner comme zone fumeurs tout ou partie de l'aéronef.

Aérogares et gares maritimes

14. L'employeur qui a sous son autorité une aérogare ou une gare maritime peut désigner comme zone fumeurs toute partie intérieure de celle-ci dans laquelle le public est admis pourvu que la surface totale des parties ainsi désignées ne représente pas plus de 30 pour cent de la surface totale des parties intérieures de l'aérogare ou de la gare maritime dans lesquelles le public est admis.

Gares ferroviaires et routières

15. L'employeur qui a sous son autorité une gare ferroviaire ou routière peut désigner comme zone fumeurs toute partie intérieure de celle-ci dans laquelle le public est admis aux conditions suivantes :

a) la surface totale de toutes les parties intérieures dans lesquelles le public est admis est d'au moins 112 m²;

b) la surface totale de toutes les parties ainsi désignées ne représente pas plus de 30 pour cent de la surface totale de toutes les parties dans lesquelles le public est admis.

Montants réglementaires

16. Le montant réglementaire payable en application de l'article 14 de la Loi, pour une infraction mentionnée à la colonne I de l'annexe II, est celui applicable visé à la colonne II de cette annexe.

Procès-verbaux de contravention

17. Pour l'application de l'article 14 de la Loi, le procès-verbal de contravention doit être conforme en substance à celui figurant à l'annexe III.

Dénonciations

18. Pour l'application de l'article 14 de la Loi, la dénonciation doit être conforme en substance à celle figurant à l'annexe III.

SCHEDULE I
(Paragraph 6(2)(b))

NO SMOKING

Red circle on white background with red bar across black cigarette

SMOKING PERMITTED

Green circle on white background with black cigarette in centre

OR

Blue square on white background with white cigarette in centre

ANNEXE I
(alinéa 6(2)b))

INTERDICTION DE FUMER

Image d'une cigarette noire barrée d'un trait rouge et encerclée d'un anneau rouge sur fond blanc

PERMISSION DE FUMER

Image d'une cigarette noire encerclée d'un anneau vert sur fond blanc

OU

Image d'une cigarette blanche au centre d'un carré bleu sur fond blanc

SCHEDULE II
(Section 16)

FINES UNDER SECTION 14 OF THE ACT

Item	Column I Provisions of the Act	Column II Fines
1	s. 4(1) or 5(3)	$50.00 for a first offence; $75.00 for a second offence; $100.00 for each subsequent offence
2	s. 3, 4(2) or 5(4)	$500.00 for a first offence; $1,000.00 for a second offence; $5,000.00 for a third offence; $10,000.00 for each subsequent offence
3	s. 10	$250.00 for a first offence; $500.00 for a second offence; $1,000.00 for each subsequent offence

ANNEXE II
(article 16)

MONTANTS RÉGLEMENTAIRES EN APPLICATION DE L'ARTICLE 14 DE LA LOI

Article	Colonne I Dispositions de la Loi	Colonne II Montants réglementaires
1	par. 4(1) ou 5(3)	50 $ pour la première infraction 75 $ pour la deuxième infraction 100 $ pour chaque infraction subséquente
2	art. 3 ou par. 4(2) ou 5(4)	500 $ pour la première infraction 1 000 $ pour la deuxième infraction 5 000 $ pour la troisième infraction 10 000 $ pour chaque infraction subséquente
3	art. 10	250 $ pour la première infraction 500 $ pour la deuxième infraction 1 000 $ pour chaque infraction subséquente

SCHEDULE III/ANNEXE III
(Sections 17 and 18)/(articles 17 et 18)

Government of Canada | Gouvernement du Canada

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VIOLATION TICKET
PROCÈS-VERBAL DE CONTRAVENTION

INFORMATION
The informant being duly sworn upon oath says on the:

DÉNONCIATION
Le dénonciateur dûment assermenté déclare ce que suit :

Date	Time/Heure	Location/Lieu
Surname/Nom	First/Prénom	Middle/Autre-prénom
Address/Adresse	Number & Street/Numéro et rue	
Municipality/Municipalité	P O Box/C P	Province
Postal Code/Code postal	Sex/Sexe	Birth date/Date de naissance

DID COMMIT THE OFFENCE OF / A COMMIS L'INFRACTION SUIVANTE

____

CONTRARY TO THE NON-SMOKERS' HEALTH ACT
CONTRAIREMENT À LA LOI SUR LA SANTÉ DES NON-FUMEURS
SECTION / ARTICLE ____________

The total amount payable for out of court payment set by law. | Le montant total à payer en cas de règlement extrajudiciaire établi par la loi.

IMPORTANT
Please read other side for instructions concerning out of court payment.

Veuillez lire les conditions du règlement extrajudiciaire au verso.

Issued by/Délivré par	Reg. No./Nº matr.	Tel No./Nº de tél

The informant says that he has reasonable grounds to believe and does believe that the person named above committed the offence indicated.

Le dénonciateur déclare qu'il a des motifs raisonnables de croire et croit que la personne sus-mentionnée a commis l'infraction indiquée ci-dessus.

Place/Lieu		Date
Justice of the peace/Juge de paix	Prov	Informant/Dénonciateur

Lab/Trav 790 (12/88)

COURT / TRIBUNAL

Canada

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SCHEDULE III—*Continued* ANNEXE III (*suite*)

Government of Canada Gouvernement du Canada

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VIOLATION TICKET
PROCÈS-VERBAL DE CONTRAVENTION

INFORMATION
The informant being duly sworn upon oath says on the:

DÉNONCIATION
Le dénonciateur dûment assermenté déclare ce que suit :

Date | Time/Heure | Location/Lieu

Surname/Nom | First/Prénom | Middle/Autre-prénom

Address/Adresse | Number & Street/Numéro et rue

Municipality/Municipalité | P.O. Box/C.P. | Province

Postal Code/Code postal | Sex/Sexe | Birth date/Date de naissance

DID COMMIT THE OFFENCE OF / A COMMIS L'INFRACTION SUIVANTE

CONTRARY TO THE NON-SMOKERS' HEALTH ACT
CONTRAIREMENT À LA LOI SUR LA SANTÉ DES NON-FUMEURS

SECTION / ARTICLE ____________

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Issued by/Délivré par | Reg. No./Nº matr | Tel No./Nº de tél.

The informant says that he has reasonable grounds to believe and does believe that the person named above committed the offence indicated.

Le dénonciateur déclare qu'il a des motifs raisonnables de croire et croit que la personne sus-mentionnée a commis l'infraction indiquée ci-dessus.

Place/Lieu | Date

Justice of the peace/Juge de paix | Prov. | Informant/Dénonciateur

Lab/Trav 799 (12/88)

INSPECTOR OR PEACE OFFICER
INSPECTEUR OU AGENT DE LA PAIX

Canada

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SCHEDULE III—*Continued*/ANNEXE III (*suite*)

Government of Canada Gouvernement du Canada

00001

VIOLATION TICKET
PROCÈS-VERBAL DE CONTRAVENTION

INFORMATION	DÉNONCIATION
The informant being duly sworn upon oath says on the:	Le dénonciateur dûment assermenté déclare ce que suit :

Date	Time/Heure	Location/Lieu
Surname/Nom	First/Prénom	Middle/Autre-prénom
Address/Adresse	Number & Street/Numéro et rue	
Municipality/Municipalité	P.O Box/C.P	Province
Postal Code/Code postal	Sex/Sexe	Birth date/Date de naissance

DID COMMIT THE OFFENCE OF / A COMMIS L'INFRACTION SUIVANTE

CONTRARY TO THE NON-SMOKERS' HEALTH ACT
CONTRAIREMENT À LA LOI SUR LA SANTÉ DES NON-FUMEURS
SECTION / ARTICLE ____________

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Issued by/Délivré par	Reg. No./N° matr.	Tel No./N° de tél

Lab/Trav 790 (12/89) ACCUSED / PRÉVENU

Canada

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SCHEDULE III—*Continued*/ANNEXE III (*suite*)

Government of Canada Gouvernement du Canada

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VIOLATION TICKET
PROCÈS-VERBAL DE CONTRAVENTION

INFORMATION
The informant being duly sworn upon oath says on the:

DÉNONCIATION
Le dénonciateur dûment assermenté déclare ce que suit :

Date	Time/Heure	Location/Lieu
Surname/Nom	First/Prénom	Middle/Autre-prénom
Address/Adresse	Number & Street/Numéro et rue	
Municipality/Municipalité	P.O Box/C P	Province
Postal Code/Code postal	Sex/Sexe	Birth date/Date de naissance

DID COMMIT THE OFFENCE OF / A COMMIS L'INFRACTION SUIVANTE

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CONTRARY TO THE NON-SMOKERS' HEALTH ACT
CONTRAIREMENT À LA LOI SUR LA SANTÉ DES NON-FUMEURS
SECTION / ARTICLE __________

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Issued by/Délivré par	Reg. No./N° matr.	Tel No./N° de tél.

Lab/Trav 799 (12/88) **ACCUSED / PRÉVENU**

Canada

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SCHEDULE III—*Continued* ANNEXE III (*suite*)

Government of Canada Gouvernement du Canada

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VIOLATION TICKET
PROCÈS-VERBAL DE CONTRAVENTION

INFORMATION
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DÉNONCIATION
Le dénonciateur dûment assermenté déclare ce que suit

Date	Time/Heure	Location/Lieu
Surname/Nom	First/Prénom	Middle/Autre-prénom
Address/Adresse	Number & Street/Numéro et rue	
Municipality/Municipalité	P O Box/C P	Province
Postal Code/Code postal	Sex/Sexe	Birth date/Date de naissance

DID COMMIT THE OFFENCE OF / A COMMIS L'INFRACTION SUIVANTE

CONTRARY TO THE NON-SMOKERS' HEALTH ACT
CONTRAIREMENT À LA LOI SUR LA SANTÉ DES NON-FUMEURS
SECTION / ARTICLE ____________

The total amount payable for out of court payment set by law

Le montant total à payer en cas de règlement extrajudiciaire établi par la loi

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Veuillez lire les conditions du règlement extrajudiciaire au verso.

Issued by/Délivré par	Reg No /N° matr	Tel No /N° de tél

The informant says that he has reasonable grounds to believe and does believe that the person named above committed the offence indicated.

Le dénonciateur déclare qu'il a des motifs raisonnables de croire et croit que la personne eus-mentionnée a commis l'infraction indiquée ci-dessus.

Place/Lieu		Date
Justice of the peace/Juge de paix	Prov	Informant/Dénonciateur

Lab/Trav 798 (12/89)

POLICE

Canada

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REGULATORY IMPACT ANALYSIS STATEMENT

(This statement is not part of the Regulations.)

Description

Bill C-27, *An Act to Amend the Non-smokers' Health Act*, received Royal Assent on June 29, 1989, and will come into force on December 30, 1989. The Act prohibits smoking in all workplaces under federal jurisdiction except in designated smoking rooms and areas. The Act affects almost 650,000 workers in about 26,700 workplaces covered by federal jurisdiction.

The Act also affects almost 240,000 employees of the Public Service of Canada. A Treasury Board policy bans smoking in all Treasury Board facilities. Therefore, they are not included in this RIAS.

This RIAS addresses regulations made under the authority of the *Non-Smokers' Health Act*, the intent of which is to protect the safety and health of non-smokers in the workplace from environmental tobacco smoke.

Alternatives Considered

Regulations are required to enable the inspectors to administer and enforce the Act.

The alternative to promulgating regulations is not to have any regulations in which case smoking would not be permitted in any workplace under federal jurisdiction. In addition, the enforcement methods would not be specified, and the Act would not be enforceable.

Consistency with Regulatory Policy and Citizens' Code

This regulation will be consistent with Regulatory Policy, in that the benefits far outweigh the costs, and the regulation was developed in tripartite consultation among industry, labour and government. It was announced in the Regulatory Plan for 1989.

Anticipated Impact

The intent of these Regulations is to protect non-smokers from second-hand tobacco smoke. There is sufficient evidence indicating that prolonged exposure to environmental tobacco smoke leads to a variety of health problems for non-smokers, and many reports show that second-hand smoke exacerbates symptoms of preexisting conditions such as angina, acute respiratory diseases, chronic obstructive lung disease, asthma, hay fever and other allergies.

Epidemiological evidence also points to increased risks of lung cancer deaths for exposed non-smokers. In Canada, of the estimated 30,000 (1985) lung cancer deaths directly attributable to smoking, approximately 500 of them are non-smokers exposed to second-hand smoke in the workplace.

Benefits

The introduction of these Regulations will result in savings of about $22 million a year in real terms, due to reduced

RÉSUMÉ DE L'ÉTUDE D'IMPACT DE LA RÉGLEMENTATION

(Ce résumé ne fait pas partie du règlement.)

Description

Le projet de loi C-27, *Loi modifiant la Loi sur la santé des non-fumeurs*, a reçu la sanction royale le 29 juin 1989 et entrera en vigueur le 30 décembre 1989. La loi interdit l'usage du tabac dans tous les lieux de travail de compétence fédérale sauf les fumoirs et les zones fumeurs. La loi touche près de 650 000 travailleurs dans environ 26 700 lieux de travail de compétence fédérale.

La loi touche aussi près de 240 000 employés dans la fonction publique du Canada. Le Conseil du Trésor a une politique qui interdit l'usage du tabac dans toutes ses installations. Celles-ci ne seront donc pas visées dans le présent REIR.

Le présent REIR porte sur le règlement pris en vertu de la *Loi sur la santé des non-fumeurs*, dont l'objet est de protéger la santé et la sécurité des non-fumeurs contre la fumée de tabac présente dans les lieux de travail.

Autres mesures envisagées

Le règlement est nécessaire pour permettre aux inspecteurs d'appliquer et d'exécuter la loi.

La solution autre que la promulgation du règlement est de ne pas avoir de règlement, auquel cas l'usage du tabac serait interdit dans tout lieu de travail de compétence fédérale. En outre, les méthodes d'exécution ne seraient pas précisées, et la loi serait inexécutable.

Conformité à la Politique de réglementation et au Code d'équité

Ce règlement sera conforme à la Politique de réglementation, car les avantages l'emportent de beaucoup sur les coûts, et le règlement a été élaboré en consultation tripartite entre les entreprises, les syndicats et le gouvernement. Il a été annoncé dans les Projets de réglementation fédérale pour 1989.

Répercussions prévisibles

L'objet de ce règlement est de protéger les non-fumeurs contre la fumée de tabac secondaire. Suffisamment de preuves indiquent que l'exposition prolongée à la fumée ambiante de tabac cause divers problèmes de santé chez les non-fumeurs, et de nombreux rapports montrent que la fumée secondaire exacerbe les symptômes de troubles préexistants, comme l'angine, les atteintes respiratoires aigües, la broncbopneumopathie chronique obstructive, l'asthme, le rhume des foins et d'autres allergies.

Des preuves épidémiologiques indiquent également un accroissement des risques de décès par cancer pulmonaire chez les non-fumeurs exposés. Au Canada, sur les quelques 30 000 (1985) décès par cancer pulmonaire directement attribuables à l'usage du tabac, environ 500 ont frappé des non-fumeurs exposés à la fumée secondaire dans des lieux de travail.

Avantages

L'adoption de ce règlement fera économiser environ 22 millions de dollars par an en termes réels, à cause de la diminution

smoke and related property damage, depreciation, maintenance and cleaning costs and in reduced ill-effects of involuntary smoking. The breakdown in savings is as follows:

Savings in maintenance and cleaning costs	$10.4 million
Savings in reduced property damage and depreciation	$1.3 million
Savings from reduced involuntary smoking	$20.5 million
Total Benefits	$32.2 million

This is equivalent to $22 million in constant (1981 = 100) dollars.

Costs

The costs of implementing these Regulations will consist of some capital costs of establishing and operating designated smoking rooms in workplaces except those under Treasury Board control.

Since the regulations do not require separately ventilated rooms for buildings built before 1990 unless reasonably practicable, the only relevant costs are operating costs. It must also be remembered that the employer is not obliged to establish designated smoking rooms.

Cost of signs: approximately $2 million

Cost to set up smoking rooms: a maximum one time cost of $19.77 million in the year of implementation. Thereafter, annual maintenance and cleaning costs of $1.43 million will apply.

Costs to air industry:

The air industry estimates that the loss of revenue to competition as a result of the ban on international flights is likely to be in the order of $90 million per year.

This potential loss of revenue would be offset to some degree, however, by the reduced cleaning, maintenance and replacement costs, plus the attractiveness to the non-smoking travelling public of smoke-free air travel.

Costs to Via Rail:

Via Rail has stated that it expects significant revenue losses because of reduced smoking areas on its trains.

Comparison of Costs and Benefits

Over the projected ten-year period (1990-1999), these Regulations will result in net benefits to employers and non-smokers of at least $12 million per year. The total cumulative amount discounted at the recommended rate of 10% is about $143 million.

des dommages provoqués par la fumée et d'autres causes connexes, de la dépréciation, des coûts d'entretien et de nettoyage et des méfaits du tabagisme passif. La ventilation des économies est la suivante :

Économies de coûts d'entretien et de nettoyage	10,4 millions de dollars
Économies dues à la réduction des dommages matériels et de la dépréciation	1,3 million de dollars
Économies découlant de la diminution du tabagisme passif	20,5 millions de dollars
Total Avantages	32,2 millions de dollars

Cette somme équivaut à 22 millions de dollars en dollars constants (1981 = 100).

Coûts

La mise en œuvre de ce règlement entraînera certains coûts en capital pour l'aménagement et le fonctionnement de fumoirs dans les lieux de travail, à l'exception de ceux qui relèvent du Conseil du Trésor.

Comme le règlement n'exige pas de fumoirs pourvu d'un système de ventilation indépendante dans les immeubles construits avant 1990 sauf dans la mesure du possible, les seuls coûts pertinents sont les frais de fonctionnement. Il faut également rappeler que l'employeur n'est pas tenu d'aménager des fumoirs.

Coût des écritaux et des symboles : environ 2 millions de dollars.

Coût de l'établissement de fumoirs : un coût ponctuel maximal de 19,77 millions de dollars au cours de l'année de mise en œuvre. Par la suite, des coûts d'entretien et de nettoyage de 1,43 millions de dollars s'appliqueront.

Répercussions financières sur le transport aérien :

Dans le transport aérien, on estime que l'interdiction de fumer à bord des vols internationaux pourrait entraîner, avec les effets négatifs sur la compétitivité, un déficit de l'ordre de 90 millions de dollars par année.

Toutefois, ce déficit pourrait être compensé dans une certaine mesure par la réduction des coûts de nettoyage, d'entretien et de remplacement ainsi que l'achalandage des vols non-fumeurs.

Répercussions financières sur Via Rail :

Chez Via Rail on s'attend à une perte de recettes importantes par suite des restrictions imposées à l'usage du tabac à bord des trains.

Comparaison des coûts et des avantages

Sur une période prévue de dix ans (1990-1999), ce règlement fera bénéficier les employeurs et les non-fumeurs d'avantages nets d'au moins 12 millions de dollars par an. Le montant cumulatif total actualisé au taux recommandé de 10 % est d'environ 143 millions de dollars.

The implementation costs of $19.77 million plus the annual maintenance and cleaning costs of $1.43 million discounted at 10% over the same period results in total cost of about $16.9 million in real terms.

Benefit-Cost Ratios: 6.2 at 15%, 7.0 at 10% and 8.0 at 5%

These Regulations restrict smoking to designated smoking rooms and areas, if the employer decides to establish them. The effect of this is to remove from quantitative analysis several potential benefits of a smoking ban such as the potential reduction in time devoted to tobacco use, the reduction in the number of smokers and the impact on employees' health due to a reduction in the actual consumption of tobacco. Nevertheless, there are real benefits. These are:

The inducement for smokers to quit smoking
Reduction in the cost of absenteeism
Reduction in productivity losses
Reduction in insurance premiums
Reduction in the costs of property damage and depreciation
Reduction in costs for property maintenance and cleaning

Paperburden and Small Business Impact

These Regulations do not impose any requirements for record keeping on the part of employers. The only paper work is related to enforcement i.e. ticketing offenders and attending court where necessary. The costs related to these activities are historic and non-incremental.

These Regulations will apply to workplaces in all industries under federal jurisdiction. The majority of small businesses are likely found in transportation and postal operations. Implementing these Regulations will not be burdensome for small transportation companies since most of them have very few office employees. For postal contractors, most of them operate in shops which are covered by provincial or municipal anti-smoking by-laws.

Costs to Tobacco Industry

It is recognized that the inducement to quit smoking may lead to reduced revenues for the tobacco industry. However, this outcome is treated as a non-quantifiable cost for the purpose of these Regulations for the same reason that the benefit related to quitting smoking was not quantified. It should also be noted that government programs exist to help the tobacco farming community switch to producing alternative crops.

Consultation

These Regulations were developed with the participation of labour and management representatives and after consultation with all affected parties. The subject regulations were published in the *Canada Gazette* Part I on October 7, 1989, with a 30 day comment period. Both Labour Canada and Transport Canada received a considerable number of submissions regarding the regulations. The vast majority of letters were fully supportive of the efforts to protect Canadians from environmental tobacco smoke, and encouraged the government NOT to weaken the regulations. There were also an uncounted number of telephone calls to the same effect.

Les coûts de mise en œuvre de 19,77 millions de dollars plus les frais d'entretien de 1,43 million de dollars, actualisés à 10 % pendant la même période entraîneront des coûts totaux d'environ 16,9 millions de dollars en termes réels.

Cœfficients coûts-avantages : 6,2 à 15 %, 7 à 10 % et 8 à 5 %

Ce règlement limite l'usage du tabac aux fumoirs et aux zones fumeurs, si l'employeur décide d'en aménager. L'effet de cette mesure est de soustraire à l'analyse quantitative plusieurs avantages éventuels d'une interdiction de fumer, comme la réduction éventuelle du temps consacré à l'usage du tabac, la diminution du nombre des fumeurs et l'incidence, sur les employés, de la baisse de la consommation réelle du tabac. Toutefois, il y a des avantages véritables, à savoir :

L'incitation des fumeurs à abandonner leur habitude
La baisse du coût de l'absentéisme
La diminution des pertes de productivité
L'abaissement des primes d'assurance
La réduction des coûts des dommages matériels et de la dépréciation
La compression des coûts d'entretien et de nettoyage

Fardeau administratif et incidence sur les petites entreprises

Ce règlement n'exige des employeurs aucune tenue de dossiers. Les seules écritures sont reliées à l'exécution, c'est-à-dire la remise de procès-verbaux de contravention et la présence dans des cours, au besoin. Les coûts afférents à ces activités sont historiques, et non différentiels.

Ce règlement s'appliquera aux lieux de travail de toutes les industries de compétence fédérale. La plupart des petites entreprises visées sont susceptibles de se trouver dans les transports et les opérations postales. La mise en œuvre de ce règlement ne sera pas une charge pour les petites sociétés de transport, car la plupart d'entre elles comptent très peu d'employés travaillant dans des bureaux. Quant aux entrepreneurs postaux, la plupart exercent leur activité dans des magasins visés par des règlements anti-tabac provinciaux ou municipaux.

Coûts pour l'industrie du tabac

Il est reconnu que l'incitation à renoncer au tabac fera peut-être diminuer les recettes de l'industrie du tabac. Toutefois, ce résultat est considéré comme un coût non quantifiable aux fins de ce règlement pour la même raison que les avantages afférents à la renonciation au tabac n'ont pas été quantifiés. Il faut également remarquer qu'il existe des programmes gouvernementaux destinés à aider les tabaculteurs à passer à d'autres cultures.

Consultations

Les règlements en question ont fait l'objet d'une publication anticipée dans la *Gazette du Canada* Partie I le 7 octobre 1989, sous réserve d'un délai de 30 jours pour les observations. Travail Canada et Transports Canada ont tous deux reçu une immense quantité de lettres au sujet des règlements. La grande majorité des intervenants appuyait entièrement les efforts visant à protéger les Canadiens contre la fumée du tabac et encourageait le gouvernement à NE PAS affaiblir les règlements. Les deux organismes ont également reçu d'innombrables appels téléphoniques dans le même sens.

Appendix "A"

Sample Questionnaire

December 1992

Airline Division of CUPE, Cabin Air Quality Survey, December 1992

Work Characteristics

Please check the appropriate response for each question.

1. AIRLINE

Air Alliance	__ 1	Canadian Airlines	__ 6
Air Canada	__ 2	Canadian Partner	__ 7
Air Nova	__ 3	First Air	__ 8
Air Ontario	__ 4	Time Air	__ 9
Air Transat	__ 5		

2. BASE

Halifax	__ 1	Winnipeg	__ 8
Quebec City	__ 2	Edmonton	__ 9
Montreal	__ 3	Calgary	__ 10
Ottawa	__ 4	Lethbridge	__ 11
Toronto	__ 5	Vancouver	__ 12
London	__ 6	Victoria	__ 13
Saskatoon	__ 7		

3. YEARS OF SENIORITY

Less than 2 years	__ 1	16-20 years	__ 5
2-5 years	__ 2	21-25 years	__ 6
6-10 years	__ 3	25 + years	__ 7
11-15 years	__ 4		

4. MONTHLY FLYING HOURS

In a typical work month, I actually fly:

Less than 65 hours	__ 1	81-85 hours	__ 5
65-70 hours	__ 2	86-90 hours	__ 6
71-75 hours	__ 3	91-95 hours	__ 7
76-80 hours	__ 4	95 + hours	__ 8

Individual Characteristics

Please check the appropriate response for each question.

5. AGE

Under 25 years	__ 1	41-45 years	__ 5
26-30 years	__ 2	46-50 years	__ 6
31-34 years	__ 3	51-55 years	__ 7
35-40 years	__ 4	55 + years	__ 8

6. GENDER

Male	__ 1	Female	__ 2

7. GENERAL HEALTH

Overall, how would you rate your health status? Please circle one response only.

Poor	Fair	Good	Very Good	Excellent
1	2	3	4	5

8. SPECIFIC HEALTH AREAS

a)	Do you have any respiratory allergies?	Yes	__ 1	No	__ 2
b)	Do you have polyps?	Yes	__ 1	No	__ 2
c)	Do you smoke?	Yes	__ 1	No	__ 2
d)	Do you regularly use decongestants?	Yes	__ 1	No	__ 2
e)	Do you regularly use antihistamines?	Yes	__ 1	No	__ 2

f) Do you take oxygen on board the aircraft? Please circle one response only.

Never	Rarely	Sometimes	Frequently
1	2	3	4

CABIN AIR PROBLEMS

9. In the last six months, have you had any problems with the cabin environment and cabin air during flight which caused physical discomfort or symptoms such as dizziness, nausea, faintness, respiratory pain, etc.? Please check one response only.

No such problems	__ 1	Three times	__ 4
Once/6 months	__ 2	More than three times	__ 5
Twice/6 months	__ 3		

If you had any of these problems, please fill out the attached report(s) on the next pages to the best of your ability for each significant incident reported above.

10. After experiencing any of these symptoms, did you approach the pilots to request additional air flow from the air packs?

Yes __ 1 No __ 2

11. Did the pilots address your concerns?

Yes __ 1 No __ 2

12. Did you report your problem(s) to the company?

Yes __ 1 No __ 2 Didn't know I could __ 3

13. Did the company address your concerns in a satisfatory manner?

Yes __ 1 No __ 2

14. Did you report your problem(s) to the union health and safety committee?

Yes __ 1 No __ 2 Didn't know I could __ 3

15. Did the union health and safety committee address your concerns in a satisfatory manner?

Yes __ 1 No __ 2

If you have additional comments, please use the back of this page.

REPORT ONE

DESCRIPTION OF SIGNIFICANT PAST AIR QUALITY INCIDENT

Date: ______________________ Flight Number: ______________________

Route (e.g. YUL-YVR, etc.) ______________________

Aircraft Type (e.g. A320, 767, etc.) __________ Aircraft Registration Number (if possible) __________

Please complete the following chart for any of the symptoms you experienced during the flight which you believe are attributable to the cabin air or cabin environment:

Symptoms	Mild	Moderate (please check one)	Severe	Was medical attention needed? (circle one)		Was any time lost? (circle one)		How much (in days)?	Did you apply to WCB/CSST? (circle one)	
Dizziness				yes	no	yes	no		yes	no
Headache				yes	no	yes	no		yes	no
Ringing Ears				yes	no	yes	no		yes	no
Shortness of Breath				yes	no	yes	no		yes	no
Blurred Vision				yes	no	yes	no		yes	no
Nose Bleed				yes	no	yes	no		yes	no
Itchy Eyes				yes	no	yes	no		yes	no
Burning Eyes				yes	no	yes	no		yes	no
Sudden Fatigue				yes	no	yes	no		yes	no
Loss of Equilibrium				yes	no	yes	no		yes	no
Dry Mouth				yes	no	yes	no		yes	no
Heart Palpitation				yes	no	yes	no		yes	no
Tightness in Chest				yes	no	yes	no		yes	no
Nausea				yes	no	yes	no		yes	no
Faintness				yes	no	yes	no		yes	no
Respiratory Pain				yes	no	yes	no		yes	no
Sinus Pain				yes	no	yes	no		yes	no
Prolonged Nasal Congestion				yes	no	yes	no		yes	no
Other (please describe)										

Did you file an injury or incident report with the company: Yes ☐ No ☐

If you have additional details about the incident, use the back of this page.

Airline Division
Division du Transport Aerien
Canadian Union of Public Employees Syndicat canadien de la fonction publique

SUMMARY RESULTS OF CABIN AIR QUALITY SURVEY

January 1994

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and
CUPE Research Department

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SUMMARY RESULTS OF CABIN AIR QUALITY SURVEY

Objectives

- To determine whether flight attendants are experiencing health problems associated with poor cabin air quality on board aircraft.

- To begin a trend analysis of problem aircraft and routes to identify priority areas requiring scientific cabin air quality testing as part of a national testing program.

Methodology

- A questionnaire was prepared asking flight attendants to identify any health problems as a result of poor cabin air quality in the previous six months. A copy of the questionnaire is attached in Appendix "A".

- The survey instrument was distributed to all flight attendant members of the Airline Division of CUPE (about 8,500) via their mail folders in December 1992.

- The union received 291 valid surveys in response.

- Based on standard sampling techniques, the survey results are statistically significant given the sample size and return rate, of at least ± 2% and > 95% confidence (> 19 out of 20 times).

- The sample is also a good fit, representing a good cross-section of flight attendants based on airline, base, seniority, age and gender.

General Results

- Slightly more than 70 per cent of all respondents (or 192 flight attendants) reported having problems associated with cabin air quality one or more times during the previous six months (July - December 1992) as follows:

No problem	29.7	
One or two times	33.0	70.3% (N = 192)
Three or more times	37.3	

- From written comments, it was clear that many respondents accepted poor quality cabin air as normal and not worth reporting. Therefore, the survey results are conservative and understate the actual level of cabin air quality problems being experienced by flight attendants.

- Cabin air quality problems and resulting symptoms were reported regardless of age, seniority, gender and state of health of the respondents
  i.e., someone with "excellent" health was equally likely of reporting problems as someone with only "fair" or "good" health.

- Smokers tended to report less cabin air quality problems.

- Cabin air quality problems varied by aircraft type in a statistically significant manner.

Symptoms in Detail

- Of those respondents reporting cabin air quality problems (N = 192), 53 per cent provided detailed first incident reports of these symptoms (N = 102). (Some respondents provided details of second and third cabin air quality incidents, but these figures are not included here.)

- Of those respondents reporting first incident symptoms (N = 102), the types and severity of reported symptoms are as follows:

	Percentage reporting symptom	Percentage reporting moderate or severe condition	Percentage requiring medical attention
Dizziness (N=64)	62.7 %	58.7 %	4.9 %
Headache (N=71)	69.6	71.4	4.9
Ringing ears (N=29)	28.4	53.5	2.0
Shortness of breath (N=45)	44.1	62.2	2.9
Blurred vision (N=16)	15.7	50.0	3.9
Nose bleed (N=12)	11.8	33.3	1.0
Burning eyes (N=36)	35.3	68.5	2.0
Sudden fatigue (N=50)	49.0	79.6	2.0
Loss of equilibrium (N=32)	31.4	59.4	3.9
Heart palpitation (N=22)	21.6	76.2	2.0
Tightness in chest (N=24)	23.5	65.2	2.9
Nausea (N=36)	35.3	55.5	2.9
Faintness (N=21)	20.6	66.7	2.0
Respiratory pain (N=13)	12.7	69.2	2.0
Sinus pain (N=25)	24.5	66.7	3.9

NOTES:

Column 1: Number with specific symptom as percentage of total sample reporting symptoms (N = 102).

Column 2: Of those reporting a specific symptom, percentage reporting a moderate or severe condition of the symptom.

Column 3: Those requiring medical attention as percentage of total sample reporting symptoms (N = 102).

- Consequences of symptoms

  There were 69 flight attendants reporting that they take oxygen on board the aircraft as a result of cabin air quality problems, or 23.7 per cent of all respondents.

  There were 17 reports of flight attendants missing at least one day of work as a result of symptoms related to problems in cabin air quality.

Complaints by Aircraft Type

- Of the 192 flight attendants reporting cabin air quality problems, 89 respondents identified the aircraft type in their incident report:

		Complaints as percentage of	
	Number of complaints	**Reported Problems** (complaint/192)	**Reported Aircraft** (complaint/89)
A-320	32	16.7 %	36.0 %
B-767	16	8.3	18.0
DC-10	11	5.7	12.4
B-747 (all types)	10	5.2	11.2
B-737	6	3.1	6.7
All others (5 other types)	14	7.3	15.7 N=89
Cannot be traced	103 N=192	53.6	

- The A-320 is twice as bad as any other aircraft type in Canada.

- Failure of pilot to act to correct cabin air quality problems

Q. "After experiencing any of these symptoms, did you approach the pilots to request additional air flow from the air packs? "

		Total cabin air problems	
Yes	105	/ 192	54.7%

Q. "Did the pilots address your concerns?"

No	91	/ 105	86.7%

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
and Prevention (CDC)
Atlanta GA 30333

STATEMENT OF

ALAN R. HINMAN, M.D., M.P.H.

DIRECTOR, NATIONAL CENTER FOR PREVENTION SERVICES

CENTERS FOR DISEASE CONTROL AND PREVENTION

PUBLIC HEALTH SERVICE

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

BEFORE THE

SUBCOMMITTEE ON AVIATION

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

U.S. HOUSE OF REPRESENTATIVES

MAY 18, 1994

Good morning, Mr. Chairman and members of the Subcommittee. I am Dr. Alan Hinman, Director of the National Center for Prevention Services, Centers for Disease Control and Prevention (CDC). In response to your letter of invitation, I am pleased to appear before the Subcommittee to discuss CDC's activities regarding: 1) the transmission of infectious diseases in the air cabin environment including the possible transmission of tuberculosis, and 2) the assurance of a healthier air cabin environment including information on the possible health effects of physical and environmental exposures.

To date, there have been documented reports of transmission of foodborne diseases on aircraft, including cholera, salmonellosis, and staphylococcal food poisoning. I shall not discuss these incidences because they are not related to the issue of airliner cabin air quality.

CDC has been involved in several epidemiologic investigations of the possibility of transmission of airborne infectious diseases that involved persons who were in aircraft. For example, an outbreak of influenza occurred in 1979 among passengers of a commercial aircraft that was delayed on the ground for three hours before takeoff. The influenza attack rate was very high--72 percent of the passengers--and was attributed to a ventilation system that was not in operation during the delay. In 1982, an epidemiologic investigation indicated that measles may have been transmitted aboard an international flight with destinations in the northwest United States.

We have no evidence that air travel puts a person at a higher risk of contracting an infectious disease than other pursuits in which close contact with other potentially infectious individuals occurs (train travel, attending school, attending conferences, etc.).

Most recently, CDC's involvement in the possibility of transmission of airborne infectious diseases in the air cabin environment has been related to infectious tuberculosis (TB). I will summarize our work regarding these investigations later in my statement.

These investigations are important because available data on possible transmission of *M. tuberculosis* in the air cabin environment are extremely limited, making it difficult for public health officials to accurately assess whether there is any increased risk of transmission among passengers.

Tuberculosis Infection and Disease

Before describing the investigations, however, let me first outline the nature of TB infection and clinically active TB, and the methods we have for preventing and controlling TB. Tuberculosis is an airborne infectious disease caused by the bacterium, *Mycobacterium tuberculosis*. The bacteria are spread

from person-to-person through the air in tiny airborne particles. These particles are produced when someone with active TB of the lungs or throat coughs, sneezes, talks, or sings. Persons sharing the same air space are at risk of inhaling these particles and becoming infected with TB. The risk of acquiring infection is increased when susceptible persons share air space for prolonged periods of time with a person who has untreated active TB of the lung or throat.

We detect TB infection by means of the tuberculin skin test. We estimate that there are 10-15 million persons infected with TB in the United States today.

Once infected, a person's body may harbor TB organisms for many years, or for life, without progressing to active TB. A healthy immune system is usually sufficient to keep most infected persons from developing active TB. However, infected persons remain at some risk of developing active TB throughout their lifetime; 5-10 percent of otherwise normal people who are infected with TB will develop active TB at some point in their lives. The risk is much higher for those with compromised immune systems.

Fortunately, TB is usually a preventable and treatable disease. We can use preventive therapy to protect most infected persons from ever developing active TB. Preventive therapy normally consists of six months of daily therapy with a single drug. Treatment of active TB normally requires 6-9 months of daily or twice-weekly therapy with two or more drugs. Unfortunately, if patients with active TB fail to take medication as prescribed, or if the regimen prescribed is inadequate, drug resistance can develop, and the drug-resistant organisms can be transmitted to other persons. The extent of the problem of drug-resistant disease is only beginning to be recognized, but it is clear that it already represents a serious public health problem in some areas. To address this situation, in June 1992, CDC published guidelines for the management of persons exposed to multidrug-resistant TB.

TB among persons who emigrate from high TB-prevalence countries also contributes significantly to the increased number of TB cases in the United States. In 1993, approximately 30 percent of the more than 25,000 reported cases of active TB in the United States occurred in foreign-born persons. Currently, the only aliens routinely tested for tuberculosis before entering the United States are applicants for permanent residence, i.e., immigrants and refugees. Tourists, students, or other short-term visitors are not normally tested for tuberculosis before they travel to the United States.

Before issuance of a visa, immigrants and refugees are medically examined by a physician designated by U.S. Embassies and Consulates. The examination includes a chest x-ray examination

for tuberculosis. If the chest x-ray is abnormal and suggests tuberculosis, the applicant must be tested further--usually by examination of a sputum specimen. If tuberculosis bacteria are found, the person must receive appropriate treatment before being allowed to travel to the United States.

Because the visa application process can be lengthy and because the medical examination is valid for one year, it is possible for a person to enter the United States several months after the examination is completed. Therefore, it is possible (although rare) for a person to develop an infectious stage of tuberculosis after completing the medical examination and before traveling to the United States. More likely, infected individuals enter the country free of infectious TB, but may develop active TB following their arrival.

Epidemiologic Investigations of TB

Recently, CDC and several State Health Departments have been involved in four epidemiologic investigations related to the possibility of transmission of tuberculosis on aircraft. These investigations were undertaken to identify, test, and recommend treatment for persons who were in contact with the infectious individual. I wish to clarify that we have not assessed the air handling systems on airplanes during epidemiologic investigations. This assessment would have required engineering expertise beyond the scope of the public health officials who conducted these investigations.

Investigation #1: The first investigation involves a flight attendant who was diagnosed with active pulmonary tuberculosis in November 1992. Treatment was begun immediately upon diagnosis and the employee went on sick leave. Due to the multi-state involvement, CDC was contacted in late December 1992, and began an investigation in January 1993. Tuberculin skin testing of other crew members who were in contact with the affected employee when the employee was potentially infectious has been completed. Analysis of data suggests that *Mycobacterium tuberculosis* infection was transmitted to crew members who flew on aircraft with the attendant. No crew member has active TB. Two exposed crew members had documented TB skin test conversions between September 1992 and February 1993. Exposures occurred in different airplane types with varying airflow specifications. In the analysis, transmission was not associated with aircraft type. The risk of infection appears to be associated with exposure to the infectious flight attendant over several flights and with increasing hours of exposure during flight. All crew members with positive tuberculin skin tests (TSTs) had at least 11 1/2 hours of flight time exposure to the flight attendant with TB. However, we know from other studies that transmission can occasionally occur with shorter exposures.

Crew members also congregate on the ground (e.g., in shuttle vans), and this provides additional potential opportunities for transmission.

Followup tuberculin skin testing was conducted to evaluate the risk of TB transmission to passengers. Of the 59 frequent fliers tested, 4 (all of whom flew in October) had positive skin tests. However, since they had no records of previous TSTs, it is not possible to determine when or where they became infected. While the possibility of TB transmission to passengers cannot be excluded, the data are inconclusive. Final results of this investigation were presented at the Interscience Conference of Anti-microbial Agents and Chemotherapy in October 1993.

Investigation #2: The second investigation, which was carried out by the Minnesota Health Department beginning in March 1993, has been completed. The investigation involved an international passenger with active TB who was on a flight that landed in Minnesota. Results were published in The Lancet, Vol. 342, July 10, 1993, and the authors concluded that..."Although the source-case was considered highly infectious, results of this investigation did not demonstrate evidence of transmission. We are unable to find reports of *M. tuberculosis* transmission among passengers on a single flight. However, the risk of exposure during air travel exists; although short term, such exposures could be intense and result in transmission."

Investigation #3: The third investigation was initiated by CDC in April 1993, and involves an international passenger who was diagnosed with active TB within a week of arrival in the United States. Of 142 exposed passengers and crew, 22 had a documented history of a positive TST before this exposure. Of the remaining 120 passengers and crew, 86 had negative TST results, 29 had positive results, and 5 had TST conversions. Of the 29 who had positive results, 27 had other identified risk factors for having a positive TST; for the remaining 2, no risk factors have been identified. The 5 passengers who had TST conversions were born in countries where *bacille Calmette Guerin* (BCG) vaccine is routinely given and none were sitting near the passenger with TB. While transmission to crew or passengers cannot be absolutely excluded, epidemiologic data in this investigation suggest that the positive skin tests and skin test conversions found among passengers and crew were probably due to a boosted immune response from BCG vaccination or prior exposure to TB. Results of this investigation were presented at the American Public Health Association meeting in October 1993.

Investigation #4: The fourth investigation involves an international passenger who was found to have active TB upon arrival in San Francisco in March 1993. This investigation, initiated in April 1993, was conducted by the California and San Francisco Health Departments. Letters were sent to all 92

passengers and crew on the aircraft, 68 of whom were residents of the United States. Responses were received from 22 persons. Of these 22, 10 had positive TSTs; however, all 10 had other risk factors for having a positive TST. Although the response rate was low, there was no evidence of transmission of TB on this flight.

In all of these investigations, the airlines cooperated fully with CDC and State and local health authorities. CDC, in turn, is evaluating all available data and is participating in the collection of data that may help determine the possibility of transmission of TB in the aircraft cabin environment.

CDC Activities Regarding the Aircraft Cabin Environment

Health Hazard Evaluations and Other Studies

CDC's National Institute for Occupational Safety and Health (NIOSH) is gaining extensive experience in investigating indoor environmental quality problems through its health hazard evaluation (HHE) program. Over the past ten years, national concern about indoor environmental quality has increased. In 1992, requests for health hazard evaluations (HHEs) concerning indoor environmental quality accounted for 40 percent of all health hazard evaluations requested, and in 1993, they accounted for 75 percent due to increased public knowledge about the program. Since 1990, NIOSH has conducted more than 400 HHEs in response to indoor environmental quality concerns. Experience gained from these evaluations will enable CDC and other Federal agencies, such as the Environmental Protection Agency, to understand better the frequently unknown causes of many indoor environmental problems, including the potential for transmission of airborne pathogens that may result from inadequate ventilation or poor maintenance techniques.

In 1991, in response to a request by the Association of Flight Attendants, NIOSH conducted an HHE to investigate potential causes of headache, dizziness, blurred vision, mental confusion, and numbness reported by employees. NIOSH assessed cabin air quality and reviewed employee medical records and company incident logs to determine whether toxic gases or lack of oxygen caused these symptoms. Measurements of levels of carbon monoxide, ozone, carbon dioxide, nitrogen dioxide, oxygen, temperature, humidity, total particulate, and volatile organic compounds did not reveal an environmental cause for the symptoms reported. Review of employee medical histories also did not indicate a work-related etiology for these illness incidences. NIOSH recommended that the airline continue to monitor cabin air for carbon monoxide levels and that further investigations should examine the possible roles of other environmental, ergonomic, and psychosocial occupational stressors.

In addition to addressing concerns about air quality, NIOSH is conducting an industry-wide study to determine whether adverse health effects may result from physical and environmental exposures in the aircraft cabin environment. The scientific literature suggests the possibility that female flight attendants may experience an increased risk of miscarriage, menstrual disorders, and other adverse reproductive experiences as a result of exposure to cosmic radiation. Computer modeling estimates from the Federal Aviation Administration (FAA) indicate that frequent air travel may expose pregnant flight attendants to ionizing radiation levels above those recommended as safe by the International Commission on Radiological Protection.

In Fiscal Year 1991, NIOSH and the FAA began designing a 10-year study of the effect of aircraft cabin exposures and other parameters such as cabin air pressure, environmental tobacco smoke, ozone, ergonomic stressors, and changes in circadian rhythm on the reproductive health of female flight attendants. The project will include three studies: a pregnancy outcome study, an ovulatory function study, and an early pregnancy loss study.

Because worker exposures are more direct and occur over longer periods of time, potential adverse health effects caused by environmental hazards would be expected to occur and be observed first among worker populations. This study will be useful in determining long-term reproductive health effects of a number of significant exposures in a large group of women of reproductive age. In addition to the health effects studies, this industry-wide study will include the most comprehensive evaluation of cabin air quality that has ever been performed aboard commercial aircraft. The FAA is currently working closely with NIOSH to design the study, and initial feasibility studies are underway.

Use of Pesticides on Aircraft for Disinsection

Federal responsibility for disease control began with the passage of the first quarantine law in 1794, and has been an activity of the Public Health Service--or its predecessor,the Marine Health Service--since 1883. By the mid-1920's, international airplane service to the United States had been initiated, and the role of the *Aedes aegypti* mosquito, the vector in the transmission of yellow fever, had been defined. The Public Health Service extended its quarantine inspection services to international airports in 1927, and concentrated its efforts on airports in the southern United States, where infected *Aedes aegypti* mosquitoes could survive if introduced. During the late 1930's, the Public Health Service expanded its inspection services and instituted insecticide spraying, i.e., disinsection, requirements to include all aircraft arriving at any U.S. port from an area infected with any vector-borne communicable disease. The first insecticides used were reportedly pyrethrum mixed with refined kerosene. This

mixture was later replaced with a freon-propelled aerosol containing pyrethrum and DDT. Other important control measures included vector surveillance and mosquito abatement programs at airports, and the development of an effective vaccine for yellow fever. The disinsection practice continued until the late 1970s.

In 1979, the Centers for Disease Control and Prevention (CDC) amended the Foreign Quarantine Regulations (42 CFR, Part 71) to discontinue requiring routine spraying because of concern for the health of passengers and crew, the lack of evidence that aircraft spraying played a significant role in disease control, and the belief that discontinuation of spraying would not present a significant public health threat. Conversely, the spraying caused undue discomfort to many passengers, and had the potential for creating acute allergic reactions, asthmatic attacks, and other allergic or respiratory problems in certain passengers. Furthermore, yellow fever vaccine was readily available and very effective in providing long-term immunity for travelers going abroad, and routine mosquito surveillance and abatement procedures around U.S. international airports were utilized to prevent the introduction and spread of insect vectors.

Currently, CDC retains regulatory authority to "require disinsection of an aircraft if it has left a foreign area that is infected with insect-borne communicable disease and the aircraft is suspected of harboring insects of public health importance." Disinsection is the responsibility of the air carrier, and is accomplished immediately after landing and blocking. The aircraft cargo compartment is disinsected before the mail, baggage, and other cargo are discharged; however, the rest of the aircraft is sprayed only after passengers and crew deplane. Since 1979, CDC has not evoked this authority.

Since routine spraying of aircraft was discontinued in the United States in 1979, there have been no outbreaks of vector-borne disease in the United States that can be attributed to imported vectors.

Smoking and Aircraft Cabin Air Quality

In discussing assurance of a healthier air cabin environment, I must mention the continuing problem of smoking on international flights. Environmental tobacco smoke has become a particularly important public health issue in recent years as the effects of exposure and associated health risks have been documented in a number of studies. The conclusions of these reports are applicable to passengers and crews who are exposed to cigarette smoke during domestic and international flights.

As you know, legislation was passed in 1990 to ban smoking on all domestic flights of 6 hours or less, which applies to approximately 99 percent of all U.S. flights. No such

legislation, however, applies to international flights although several airlines have voluntarily imposed additional restrictions, including smokefree international flights. In October 1992, the International Civil Aviation Organization, a United Nations advisory group based in Montreal, adopted a resolution calling for smokefree flights by July 1, 1996. It is our hope that this resolution will culminate in a general policy prohibiting smoking on all commercial airline flights worldwide.

Conclusion

In summary--returning to the questions you posed in your letter of invitation--I wish to reiterate that CDC currently has no data to indicate an increased risk of transmission of infectious diseases among passengers in an airplane as compared to persons in any other confined environment. However, suggestive evidence exists of the possibility of TB transmission among flight crew members, although this transmission could have occurred on the ground.

Finally, regarding cabin air quality, studies are currently underway to assess whether there are health risks associated with the air cabin environment; however, CDC is not currently conducting any studies to determine whether the health of persons exposed to insecticide spray in the aircraft environment is adversely affected.

Mr. Chairman, this concludes my formal statement. I will be glad to respond to any questions you or the Subcommittee members may have.

Statement of
Stephen L. Johnson
Acting Director, Registration Division
Office of Pesticide Programs
U.S. Environmental Protection Agency
Before the
Subcommittee on Aviation
Committee on Public Works and Transportation
U.S. House of Representatives

May 18, 1994

Good morning. My name is Stephen L. Johnson; I am the Acting Director of the Registration Division within EPA's Office of Pesticide Programs. I am pleased to be here this morning to discuss the role of the Environmental Protection Agency (EPA) in protecting the health of U.S. citizens while traveling on airplanes from the risks posed by pesticides. In my testimony this morning, I will focus specifically on the use of pesticides on airplanes and on EPA's current activities to reduce the reliance on this use of pesticide products in quarantine programs and to better protect the health of U.S. citizens traveling on airplanes.

Introduction

EPA is responsible for regulating pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). This law generally requires EPA to license, or register, pesticides before they can be sold in this country. Pesticide registration decisions are based on a risk/benefit standard in the law which calls for EPA to approve only those pesticides which will not pose a risk of unreasonable adverse effects to man or the environment.

Many national governments, including the U.S., have

developed quarantine programs that rely on pesticides as a tool to help protect against the inadvertent transportation of a pest species to a new location and to protect commercial cargo from damage by pests. For airplanes, the quarantine programs are aimed primarily at controlling insect pests that are associated with communicable disease. Special efforts are made to control mosquitoes, potential carriers of malaria. Treatments are also designed to control pests that may diminish agricultural productivity.

The Centers for Disease Control and Prevention (CDC) and the U.S. Department of Agriculture (USDA) are jointly responsible for the design of quarantine programs in the U.S. Some activities of these programs target specific insect and rodent species that may pose a threat to public health. Airplanes suspected of harboring insect pests associated with communicable disease may be treated with an insecticide. This process is known as aircraft "disinsection". In the U.S., disinsection is performed only after passengers and crew have de-planed. The pesticides that are used in these programs are registered by EPA and must be applied in a manner which is consistent with the product's labeling.

EPA has several pesticides registered for use on airplanes. Most of these are used to treat the cargo area. One chemical, known as sumithrin, received registration from EPA for use as an in-flight spray in July 1979. This registration authorizes use of the pesticide in the cabin area while passengers and crew are

aboard.

Later in 1979, the CDC concluded that there is no real risk of disease transmission from insects aboard an aircraft. Accordingly, the CDC amended its requirements for disinsecting airplanes and determined that the routine treatment of an airplane's cabin area was not necessary. The CDC decision applies to domestic flights and international flights arriving in the U.S.

Other governments have developed quarantine programs that are not fully consistent with the U.S. quarantine program. One aspect of these quarantine programs of particular concern to EPA is that, in many cases, other governments require the use of an in-flight spray. The products are typically applied by airline personnel as they walk about the cabin area just prior to arrival. In such instances, passengers may not be allowed to de-plane unless airline personnel can demonstrate that the cabin was treated. Although a complete listing of all of the governments that require in-flight spraying for incoming air traffic is not available at this time, we are aware that many countries in Central and South America and other regions of the world may require in-flight disinsection. The Department of Transportation (DOT) is preparing an up-to-date list of the countries that require in-flight spraying.

It is flights from the U.S. to these locations that are the subject of a significant amount of work at EPA currently. These efforts can be divided into three categories. First, EPA is

working to understand better the implications for public health of exposure to in-flight sprays. Second, EPA is assisting in efforts intended to inform other governments about U.S. experience with the use of pesticides in quarantine programs. Finally, EPA is also supportive of the development of mechanisms for better informing passengers about a pesticide treatment -- before it occurs. This notification could be especially important for travelers who are chemically sensitive or have respiratory problems or certain other medical conditions that could be effected.

In-flight Spraying -- Health Concern

EPA has registered a pesticide known as sumithrin for use in the cabin area when passengers and crew are present. Sumithrin products also are registered for application in homes and gardens, greenhouses, and pet quarters. Sumithrin belongs to a class of chemical compounds known as synthetic pyrethroids. The available data indicate that these chemicals are generally low in toxicity to humans.

In early 1993, however, EPA became aware of several incidents in which U.S. citizens experienced adverse reactions after being exposed to an in-flight pesticide treatment. Both airline personnel and passengers have reported the adverse reactions. Although EPA has an adequate understanding of the long-term health risks posed by this pesticide on the general public, the reaction of this susceptible sub-population must be investigated further. In particular, EPA is concerned that

individuals who are chemically sensitive, suffer from respiratory problems, or allergies may have an adverse reaction. The reported health symptoms associated with the spray range from headaches and nausea to more severe cases in which seizures and memory loss were to have occurred.

The Agency is aware of reports that approximately six people may have suffered adverse reactions following in-flight exposure. These individuals may be particularly sensitive to chemical exposures. The medical community and health authorities are divided in their assessment of the nature and causes of this phenomenon, often referred to as Multiple Chemical Sensitivity (MCS). In order to improve our scientific understanding with respect to this problem, EPA funded a study by the National Academy of Sciences (NAS). EPA asked the National Research Council (NRC) of the Academy to recommend research directions for working on this issue in the future. The report was published in 1992 and has provided the research community with useful information on this issue.

With respect to this particular pesticide, EPA is working with the pesticide's manufacturer to obtain additional information on the product. The mechanism EPA is using to accomplish this is known as a "Data Call-In" Notice (DCI). On March 16, 1994, EPA issued a DCI to the registrants of these products which required that they develop toxicity data to support the continued registration of sumithrin for the in-flight use. This information will enable EPA to understand more fully

the toxicological properties of the pesticide and determine if this use practice provides for an adequate margin-of-safety for all sub-populations. The companies have until mid-June to indicate whether they intend to develop the requested data. If the companies fail to comply with the DCI, EPA will initiate suspension proceedings against these pesticide products.

EPA also is reassessing the labeling for these products. EPA relies upon pesticide labels to convey important safety information about each product. The labeling of one of these products contains a warning statement which advises against exposing the product to the skin or breathing the product's vapors. At the same time, the directions for use state that treatment should take place 30 minutes prior to landing and that ventilation systems should be turned off while the cabin is sprayed. In light of this use pattern, however, it is impossible to prevent dermal or inhalation exposures to passengers during an in-flight cabin application.

EPA recognizes that the use pattern and warning information for this product are inconsistent with one another. Accordingly, EPA is working with the pesticide's manufacturer to develop a new label for this product that is protective and appropriate.

<u>Information-Sharing with Other Governments</u>

Separately from EPA's efforts to understand better the safety concerns associated with in-flight pesticide treatments, the Agency is participating in work with DOT and the Department of State to inform other governments about U.S. concerns raised

by the in-flight spraying. To this end, EPA assisted in the development of a diplomatic cable that was transmitted to all foreign ministers of transportation on this topic on April 16. The cable indicated that the U.S. no longer requires in-flight spraying. The cable also asked other governments to identify their quarantine requirements so that a list of countries that require in-flight applications can be developed. The cable also indicated that the U.S. intends to begin a notification program to U.S. citizens about spraying practices in foreign countries. Finally, the cable also referenced the adverse health effects reports that have been received from U.S. citizens and conveyed the questions that were raised about the efficacy of this type of treatment to control insects.

The effectiveness of this type of treatment has been questioned because this chemical breaks down fairly rapidly. The consequence of this characteristic is that the product's residues will provide little lasting pest control. Moreover, the vapor pressure of this product is too low to allow the spray to penetrate the entire cabin area.

EPA is available to assist the Committee and DOT in working to promote the adoption of U.S. policy with respect to in-flight spraying by other governments. We believe that other governments are likely to come to the same conclusion that U.S. health officials have reached once they review all the information currently available.

Passenger Notification

EPA also supports efforts to develop a suitable mechanism for informing passengers about the treatment. The pesticide applications may occur now without any advance notification to the travelers. EPA believes that U.S. citizens have a right to know that they may be sprayed with a pesticide before they travel to a foreign country. This approach is consistent with our emphasis on advance notification in other areas such as worker safety. EPA believes that notification that occurs at the time the ticket is issued may be the most appropriate time to inform travelers about the spray. Notification that occurs after travel arrangements have been made does not allow for alternative plans to be made to avoid exposure to the spray.

Conclusion

EPA is committed to the development and promotion of policies that minimize exposure to pollutants to the greatest extent possible. With respect to pesticides, EPA is working with other agencies responsible for regulating pesticides to reduce the use of traditional chemical pest controls. Specifically, EPA is working to promote the use of low toxicity products and biological control strategies where possible. Consistent with this approach, EPA will assist in the development of quarantine policies that meet the public health needs of foreign governments and protect U.S. citizens traveling to these locations.

I would be happy to take any questions that you might have.

STATEMENT OF JON L. JORDAN, M.D., FEDERAL AIR SURGEON, FEDERAL AVIATION ADMINISTRATION, BEFORE THE HOUSE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, SUBCOMMITTEE ON AVIATION, CONCERNING CABIN AIR QUALITY. MAY 18, 1994.

Mr. Chairman and Members of the Subcommittee:

I am Jon L. Jordan, FAA's Federal Air Surgeon. Accompanying me is Thomas E. McSweeny, Director of FAA's Aircraft Certification Service. We are pleased to appear before you today to discuss the issue of airliner cabin air quality.

I know this issue is one of long-standing interest to the Subcommittee, and I want to assure you that we in the FAA have taken seriously the concerns that have been raised about cabin air quality. In response to these concerns, the Department of Transportation (DOT) has undertaken its own study, and we have carefully reviewed research conducted by others. All of the studies reviewed thus far -- those conducted by the DOT, other governmental agencies, and the air carrier industry -- have found no evidence of health problems with the air quality aboard air carrier aircraft, although the Geomet study, as I will describe later, did identify a ban on smoking as the means of providing the greatest improvement in cabin air quality. All of the studies confirm to us that the air quality aboard an aircraft is at least as good as that commonly found in many other indoor workplaces or office environments.

In order to provide for the protection of aircrews and passengers, FAA has regulatory requirements to ensure that aircraft cabins are properly ventilated. Our regulations provide that each passenger and crew compartment must be suitably ventilated, and they establish maximum allowable levels for carbon monoxide, carbon dioxide, and ozone for crew and passenger compartments. We believe that these regulations are met in all current aircraft operations. The FAA has recently proposed a rule change to further limit

carbon dioxide in the passenger cabin for newly-certificated transport airplanes. That proposed rule was published on May 2, 1994.

I would like to take a moment to review with you the results of research that has been conducted to date on cabin air quality. In 1989, under contract with the Department of Transportation, Geomet Technologies conducted a scientific study of airliner air quality. Geomet monitored 92 randomly-selected commercial flights in current aircraft types. Since the study included newer aircraft, which augment fresh air by recirculating filtered cabin air, the report's conclusions remain valid today.

Geomet found that levels of ozone, biological aerosols, and carbon monoxide were low in aircraft cabins. Carbon dioxide levels were somewhat higher than recommended for comfort, but well within the safety limits of the Occupational Safety and Health Administration's air quality standards. The study noted that a ban on smoking would provide the greatest improvement in cabin air quality, and subsequent Congressional and DOT action has resolved that concern for domestic flights. The Geomet study documented that cabin air quality showed no basis for medical concern.

In 1991, the National Institute for Occupational Safety and Health (NIOSH), in response to a request from the Association of Flight Attendants, investigated potential causes of headache, dizziness, and other symptoms reported by flight attendants. NIOSH studied cabin air quality, measuring levels of carbon monoxide, ozone, carbon dioxide, nitrogen dioxide, oxygen, temperature, humidity, and other factors. NIOSH found no evidence of an environmental or work-related cause for the symptoms reported.

The most recent study we have reviewed was released in April of this year by the Air Transport Association (ATA). This study of cabin air quality further demonstrated that

the environment on-board aircraft does not pose a health risk to airline passengers and crew. Our review of the study shows it to be thorough and statistically valid. ATA tested and monitored cabin air and other environmental qualities on 35 flights. The study included older aircraft using all fresh-air circulation systems, as well as newer ones using partial recirculating systems. The ATA study found that air particulate and contaminant levels, volatile organic compounds, and carbon dioxide levels all indicated adequate aircraft ventilation and posed no health risk. Biological contaminants were also found to be low, another indication of an efficient ventilation system.

The ATA study did find low humidity levels in cabin air due to the dry air brought into aircraft at high altitudes. Dry air can be linked to complaints by passengers and crew about the cabin environment, since dehydration sometimes leads to symptoms such as sore throats and headaches. Air travelers can limit or eliminate these symptoms through increased consumption of fluids during flight. While the air aboard an aircraft may be relatively dry due to the intake of little ambient water vapor at cruising altitudes, incoming fresh air is likely to be cleaner than that entering most indoor spaces on the ground. In addition, the dryness hinders the growth of many microorganisms that could cause potential health risks in cabin environments. Increasing the cabin's humidity level could create a moist, enclosed environment that would contribute to the growth of mold, mildew, and fungus, as well as encourage aircraft corrosion.

Research indicates that commercial air travel poses no unique or significant risk to the health of passengers or crew. When compared to the air quality in many homes, office buildings, or other enclosed spaces where people congregate, the air quality in air carrier operations is satisfactory. For those aircraft that recirculate air, the number of times air is exchanged ranges from approximately ten to twenty times per hour. The average older home exchanges air once an hour, and the average office building exchanges air an

estimated two to four times an hour. As shown by the Geomet and ATA studies, both of which included newer and older aircraft, the use of recirculated air in aircraft ventilation systems has no apparent health significance.

The Centers for Disease Control and Prevention (CDC) is investigating the possible transmission of communicable diseases, such as tuberculosis, in passenger aircraft. We have reviewed the published research conducted thus far on the aircraft cabin environment, and have found no indication that cabin ventilation is a factor in spreading disease. Disease is spread most often through personal contact, which can occur anywhere people congregate, such as in homes, schools, offices, theatres, trains, and passenger aircraft. Although there is anecdotal information about people developing upper respiratory infections after flights, we are not aware of any studies specifically identifying cabin ventilation as a factor in spreading disease. However, we encourage the research conducted by CDC, and CDC has been informed of our desire to participate in their studies.

In closing, Mr. Chairman, I would like to assure you that the FAA shares the concern for ensuring that the air quality in air carriers is satisfactory for the health and safety of both passengers and crew. Studies that have been conducted to date show no evidence of any measurable risks under the current regulatory standards and airline practices. We continue to offer assistance and cooperation to the Centers for Disease Control in the investigation of areas of possible concern.

That completes my prepared statement, Mr. Chairman. I would be pleased to respond to any questions you may have at this time.

Statement of James E. Landry
President, Air Transport Association
Before the House Committee on Public Works
and Transportation Subcommittee on Aviation
Cabin Air Quality hearing
May 18, 1994

Mr. Chairman:

I am James Landry, President of the Air Transport Association. ATA's member airlines transport more than 95 percent of all passenger traffic in this country. I am accompanied today by Mike Rioux, Vice President, Engineering, Maintenance & Materiel for ATA, and Dr. Jolanda Janczewski, President of Consolidated Safety Services, Inc. I appreciate the opportunity to appear before the subcommittee today to discuss the issue of airline cabin air quality. The subcommittee staff has indicated that you wish to cover three topics today: cabin air quality, in-cabin insecticide spraying, and smoking on international flights. My testimony will address these subjects, and with the help of Mr. Rioux and Dr. Janczewski, we will be happy to answer any questions the members of the subcommittee may have.

CABIN AIR QUALITY

Mr. Chairman, a fair amount of media attention has been given to the subject of airline cabin air, reflecting complaints by some airline passengers and crew members about the air quality environment aboard passenger aircraft. The scheduling of this hearing, is no doubt in response to such complaints and public attention.

The environmental control systems on transport aircraft are designed to meet or exceed FAA requirements and aerospace industry standards and guidelines for air quality

and air distribution. Aircraft design criteria also satisfies health guidelines established by OSHA and the American Conference of Governmental Industrial Hygienists.

A 1989 study funded by the U.S. Department of Transportation was conducted to quantify pollutant levels in airline cabins and to assess the associated health risks. Tests were conducted on 92 flights and the levels found in the study were below the levels thought to pose health risks.

The airline industry has always viewed safety as its top priority, and thus the health and welfare of our passengers and employees is a major concern for the industry. While previous studies such as the one completed by DOT provide valuable data, ATA just completed another study of airline cabin air quality in order to assess the validity of recent complaints.

ATA contracted with the firm of Consolidated Safety Services, Inc. (CSS) to do a comprehensive study of aircraft flown by U.S. airlines. Air samples from 35 flights of varying lengths were taken from eight major airlines and four types of aircraft (the Boeing 727 and McDonnell Douglas DC-9, representing older, all fresh-air circulation systems, and the Boeing 757 and McDonnell Douglas MD-80, representing newer, partial recirculating systems). Given the concern that newer model aircraft systems might not provide the same level of ventilation, the goal was to study both older and newer model aircraft in order to get a representative sample of the U.S. airline fleet which transports millions of passengers and thousands of crew members each day. Flight crews were not notified of the testing, so

that actual flight conditions could be measured, and the flights were chosen independently by CSS, without consultation with ATA or the carriers.

While the complete study and the CSS report is attached for your thorough review, the findings confirmed that both generations of aircraft exceed the requirements for maintaining a healthy air quality environment. The findings, in summary, include:

- Air particulates and contaminants were extremely low, indicating an excellent air filtration system.
- Volatile organic compound levels, even at their highest during food and beverage service, were never at a level to cause passenger discomfort.
- Carbon dioxide levels easily met OSHA standards. While sometimes exceeding the comfort levels recommended by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), carbon dioxide levels when combined with other measurements indicate an adequate ventilation of the aircraft and pose no health risk.
- Relative humidity of in-cabin air is low, but that is to be expected because of the extremely clean, dry air from the atmosphere that is being taken in and circulated through the cabin. Any personal discomfort associated with low humidity levels can be offset by passenger and crew intake of fluids such as water or juice. In addition, the low humidity assists in keeping the cabin relatively particle, bacteria and germ-free.
- Temperature variation does not indicate a problem with aircraft ventilation

systems.

- Biological contaminants were low -- especially for a confined space often crowded with people -- another indicator of an efficient and adequate air ventilation system.
- In-cabin noise levels were well below OSHA noise exposure limits.

Mr. Chairman, I would like to comment on several aspects of this issue which I hope you and the subcommittee members will take into account during this hearing.

Some allege that the industry's move to a recirculated system was part of a scheme to simply save money, since these aircraft are more efficient to operate. While I will defer to the testimony of aircraft manufacturing representatives to explain the details and benefits of these recirculation systems, there are a couple of points to consider. These new aircraft systems were designed during a time when the entire U.S. economy was grappling with the energy crisis of the 1970s: office buildings were designed to increase energy efficiency by sealing windows; automobiles were engineered for better gas mileage efficiency. The introduction of recirculation systems represented a major breakthrough in technology that helped to reduce energy consumption and maintain high cabin air quality. Recirculation systems were not designed to sacrifice passenger and crew health as some sort of trade-off. The fact is the air quality of aircraft using recirculation systems exceeds that in most offices and other public buildings -- probably including this hearing room.

We have already heard criticism about the ATA study being self-serving or simply an attempt to influence this hearing. The decision by the ATA Board of Directors to

underwrite the cost of the study was made in March, prior to this subcommittee expressing any interest in a hearing. Our goal throughout the project was to complete a study that was accurate and objective in order to assess the complaints about cabin air quality. The parameters of the study were proposed by CSS, not the airlines. CSS picked the air carriers and the flights without consulting ATA or the airlines. Flight crews were not notified so that critics could not charge that we had somehow manipulated the data collection process. CSS' findings support the conclusions of DOT's own study.

Other issues, such as the transmission of infectious disease on-board aircraft, are complicated issues that the Centers for Disease Control and other federal health agencies are looking into. While we are confident that aircraft ventilation systems filter the cabin air and do not encourage or facilitate the spread of diseases, there is no system in the world that can prevent a person with an infectious disease from not exposing others in the immediate proximity. Passengers and crew members should act responsibly in this public health issue by not flying when they are sick, just as they should not come to work or send their children to school with an infectious disease.

This is not to say that the industry wishes to simply dismiss the complaints about the effects of airline travel, and we have taken several steps in this regard. In 1993, ATA along with aircraft manufacturers, the Aerospace Industries Association (AIA) and the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) formed a Cabin Air Quality Task Force to review the current ASHRAE standards for air quality and

to develop cabin air quality educational material and travel tips for the public. As part of this task force, ATA has just published a consumer brochure to remind passengers how to alleviate any discomfort and is also working with the Aerospace Medical Association to update the medical criteria for passenger travel.

In conclusion, the findings of the CSS study, in combination with numerous other government reviews, support conclusion that cabin air quality poses no health risks. Airline travel can be taxing on the body; it takes one across multiple time zones in a very short time period in an environment that is dry. Passengers and crew members should prepare themselves accordingly, such as getting adequate rest, drinking plenty of water and fruit juices to keep the body hydrated, and removing contact lenses on long flights. If more fresh air were introduced at altitude, it would only lower humidity levels further and increase passenger discomfort. Passenger aircraft have been designed to maintain a quality environment, and airlines can and do operate their aircraft to make the cabin environment a healthy one.

AIRCRAFT INSECTICIDE SPRAYING ON INTERNATIONAL FLIGHTS

We believe approximately 20 countries -- mostly in Central and South America and the Caribbean -- presently have legal requirements that arriving aircraft be sprayed with insecticide before hatches are opened upon landing. We understand that Australia and New Zealand also require "disinsection" of aircraft, though apparently these nations allow, as an

alternative, the periodic treatment of empty passenger cabins with more powerful "residual" pesticides.

Aircraft spraying is endorsed by the World Health Organization for the purpose of eliminating insects that purportedly may carry agricultural or human disease. Though we do not believe the insecticide used aboard U.S.-flag aircraft in-flight, which is registered by the U.S. Environmental Protection Agency ("EPA"), poses a health concern to the overwhelming majority of passengers, ATA member airlines applaud the efforts of the Departments of Transportation and State to encourage foreign nations to discontinue these spraying requirements. We believe U.S. Government findings have shown that aircraft insecticide spraying has limited effect in killing stow-away insects. More importantly, the air carriers wish to avoid, if at all possible, any practice that may cause discomfort or the possibility of allergic reaction for any passenger or crew member.

Through no fault of their own, the U.S. airlines, along with their passengers, are caught between the proverbial "rock and hard place" on this issue. If the carriers were to refuse to spray, they would be in violation of international agreements, receive fines imposed by foreign governments, and likely still be subject to having aircraft sprayed by foreign governmental agents upon arrival at the gate prior to disembarkation of passengers. Also, since EPA registration standards would not then apply, the airlines would have no control over the type of insecticide dispensed. Moreover, refusal of U.S. carriers to comply with foreign spraying requirements could possibly lead to denial of landing rights. In such a case,

passengers wishing or needing to travel to these destinations would be forced to fly on foreign airlines, thereby being denied the competitive service of U.S. airlines, and they still would be sprayed with insecticide (containing unknown chemical agents) while enroute.

With regard to nations that may allow periodic "residual" treatment of aircraft as an alternative to spraying during each flight, we have been informed by EPA pesticide registration officials that no pesticides currently are registered in the United States for residual treatment of aircraft passenger cabins. Thus, U.S. carriers could only employ this option if the treatment was conducted abroad using foreign-made pesticide. Moreover, EPA has not examined the potential health risks associated with this method of disinsection. Though the problem of direct inhalation of pesticide would be avoided, passengers would still come into contact with longer-lasting insecticide chemicals in the fabric of aircraft seats. Thus, the residual treatment alternative in not an acceptable solution.

Finally, to the extent that some nations may persist in requiring arriving aircraft to be sprayed prior to landing, ATA calls upon EPA officials to clarify the agency's position promptly with regard to continued registration and use standards for aircraft insecticide. We understand that the agency has issued a "data call-in" to Airosol Company, Inc., the sole registered manufacturer of insecticide authorized in the United States for use in-flight with passengers aboard. This "data call-in" requires the manufacturer to submit the results of extra toxicological testing, conducted at considerable expense to Airosol, in order to maintain its pesticide registration. Obviously, the demand is quite limited for insecticide

manufactured specifically to meet the non-flammability and non-corrosiveness requirements for use in aircraft. Accordingly, since this pesticide is not a major product line for Airosol, Inc., any unnecessarily costly or time-consuming EPA registration requirements may have the effect of encouraging Airosol to cease production.

We have been informed by company officials that, in light of recent negative publicity, Airosol, Inc. has only reluctantly agreed to continue production of aircraft insecticide, primarily as an accommodation to the airlines and their passengers. If the pesticide registration and use requirements become too onerous, however, a situation may exist where no EPA-approved product is lawfully available for airborne use in U.S.-flag aircraft. Under these circumstances, U.S. carriers would have no choice but to accede to foreign government demands that planes be sprayed upon landing with "foreign" pesticides prior to passenger disembarkation.

For these reasons, ATA urges State and Transportation Department officials to vigorously pursue efforts to encourage other nations to rescind their insecticide spraying requirements.

SMOKING ON INTERNATIONAL FLIGHTS

While smoking on domestic U.S. flights has been eliminated, the issue of smoking on international flights to and from the U.S. continues to be debated. The U.S. airline industry supports the efforts by the International Civil Aviation Organization (ICAO) to achieve a

smoking ban that will lead to uniform worldwide guidelines and rules. The U.S. government's efforts to facilitate such an agreement are fully supported by the industry. However, any such ban must be fairly and consistently applied to both U.S. and foreign flag carriers. ATA member carriers are looking at and experimenting with non-smoking flights in specific international markets. The consumer reaction to those efforts cannot yet be measured. Therefore, the industry views any proposal to impose a unilateral smoking ban on all international flights of U.S. airlines as a policy that would create a tremendous competitive disadvantage for U.S. carriers who serve nations and regions of the world where smoking is not a public health concern and is still an accepted practice of that culture.

AIRLINE CABIN AIR QUALITY STUDY

Submitted To:

Air Transport Association of America
1301 Pennsylvania Avenue, N.W.
Suite 1100
Washington, D.C. 20004-1707

April 1994

EXECUTIVE SUMMARY

The Air Transport Association of America, the trade association that represents all major U. S. airlines, contracted with Consolidated Safety Services, Inc., of Oakton, Virginia to conduct a comprehensive study of airline cabin indoor air quality. The study examined environmental parameters and indoor contaminants aboard 35 flight segments comprising two "newer" type of aircraft (McDonnell Douglas MD-80 and the Boeing 757) and two "older" type of aircraft (Boeing 727 and McDonnell Douglas DC-9), operated by eight top U.S. passenger carriers.

A minimum of eight flight segments were evaluated for each type of aircraft and four segments for each carrier. In all cases, monitoring was intended to be and generally was conducted surreptitiously, without the knowledge of the cockpit crew. Flights were selected at random by Consolidated Safety Services, Inc. without consultation with the Air Transport Association or its members.

Evaluation of cabin air quality is based upon analysis of, comparison to, and relationships between a multitude of factors. No single measurement of environmental contaminant or condition is a sufficient basis from which to draw conclusions about air quality. Therefore, continuous monitoring equipment was used to obtain flight duration profiles for several environmental parameters including carbon dioxide levels, temperature, relative humidity and noise. Continuous monitoring was also performed for total volatile organic compound levels and respirable particulate levels. In addition, single air samples were taken during the early phase of each flight segment, as well as the late phase of each flight segment to obtain quantitative and qualitative analysis of bacterial and fungal contaminants.

The results of the study indicate that levels of contaminants found in airline cabins are not likely to cause adverse health effects. While the air may be dry due to the intake of little ambient water vapor at cruising altitudes, incoming fresh air is likely to be cleaner than that entering most indoor spaces on the ground and the dryness is beneficial in hindering the growth of microorganisms that could cause potential health risks in cabin environments. Other common indoor contaminants, including volatile organic compounds and respirable particulates, were found at levels low enough to indicate that adequate ventilation is being supplied to the cabin environment. Data also indicate that all contaminant levels (biological, particulate and volatile organic compounds) are directly proportional to the number of cabin occupants indicating that the source of most contaminants are people and their activities. Even then, airline filtration systems for all types of aircraft are more than sufficient in removing contaminants from the air inside the aircraft.

While relative humidity levels were below that recommended by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the potential for health effects is nearly nonexistent. Low relative humidity is directly associated with the low water vapor level of fresh air entering the airline cabin at cruising altitudes. While humidification of the air may be common in buildings where relative humidity is excessively low, increasing airliner cabin moisture levels presents a high risk for biological growth and potential health hazards. The benefit of reducing this risk to the greatest extent possible outweighs the potential for passenger discomfort due to low relative humidity. In addition, passenger discomfort can be easily reduced through the proper intake of fluids during and immediately following airline travel.

Average carbon dioxide levels for all types of aircraft were found to be significantly below the health hazard threshold of 5,000 ppm, established by the Occupational Safety and Health Administration (OSHA). ASHRAE recommends a limit of 1,000 ppm carbon dioxide to satisfy comfort and odor criteria. Since, as the data demonstrates in this study, airline cabin contaminant levels are below those commonly seen in other indoor spaces, removal of contaminants appears to be sufficient.

Results of the study did not reveal a potential for human health hazards. Total and average levels for volatile organic compounds, respirable particulates and bacterial and fungal contaminants were relatively low for all types of aircraft, seating configuration, flight duration and airlines. While the data show that the air in aircraft cabins is relatively clean, slight apparent differences indicated between type of aircraft, seat location and flight duration would require additional analyses to determine statistical significance.

TABLE OF CONTENTS

INTRODUCTION

SECTION 1: INTRODUCTION

A. BACKGROUND

Airliner cabins provide temporary accommodations to approximately 475 million passengers and over 130,000 flight crew members each year, within the United States. Providing acceptable indoor air quality for such a large number of individuals in a relatively small area remains an ongoing challenge and concern for the airline industry. Controlling the air quality of the passenger environment is dependent upon striking a good balance between cabin airflow, fresh air supply, humidity, and temperature, while not compromising individual comfort and health or the safe operation of the aircraft.

While some past studies have addressed airline cabin air quality and the potential for health hazards associated with various indoor contaminants and environmental factors, there has been a dearth of comprehensive information to provide for scientifically sound conclusions.

Congressional hearings during 1983-1984 revealed that existing information on transport aircraft cabin air quality was contradictory. Therefore, under Public Law 98-466, Congress stipulated that the National Academy of Sciences enter into a contract with the Federal Aviation Administration (FAA) to determine, *inter alia*, whether such aspects of cabin air as the quantity of outside air, quality of on-board air, characteristics of humidification, contaminants, and pollutants could be responsible for health problems in the long or short term. In response to this request, the Committee on Airliner Cabin Air Quality was established in the National Research Council's Commission on Life Sciences.

The Committee conducted an 18-month study of relevant issues and released their final report to Congress in February, 1987. The report concluded that,

> "Empirical evidence is lacking in quality and quantity for a scientific evaluation of the quality of airliner cabin air or of the probable health effects of short or long exposure to it....The Committee therefore recommends that FAA establish a program for the systematic measurement, by unbiased independent groups, of the concentrations of carbon monoxide, respirable suspended particles, microbial aerosols...on a representative sample of routine commercial flights."

Many of the studies which have been published have addressed only limited target issues such as specific contaminants (i.e., environmental tobacco smoke or ozone), types of aircraft manufactured, or occupant profiles (i.e., pilots, elderly passengers, pregnant flight attendants). In addition, some studies have been conducted in response to specific incidents. For example, the National Institutes of Occupational Safety and Health (NIOSH) conducted a Health Hazard Evaluation (HHE) in response to a request received from the Association of Flight Attendants, in April 1990, to determine the potential employee exposures to toxic gases and/or a lack of oxygen aboard some McDonnell Douglas MD-80 airplanes. The request resulted from reported incidents that occurred on passenger flights during which some of the flight attendants experienced illness symptoms which were allegedly attributed to the cabin air quality. The NIOSH report concluded that the environmental and medical data do not support the hypothesis that exposure to toxic gases or lack of oxygen was the cause of the in-flight incidents.

While all the studies conducted since the 1987 Congressional Report have provided insight to specific aspects of airliner cabin passenger health and comfort, only one has provided an overall air quality profile based upon a multitude of air carriers, flight durations, and type of aircraft. While this one study, conducted in 1989 by Geomet corporation for the U. S. Department of Transportation, examined the air quality study aboard 92 aircraft, the environmental monitoring instrumentation used in the study has now been surpassed by currently available state-of-the art measurement devices which can now provide a more accurate evaluation of in-flight air quality.

B. AIR TRANSPORT ASSOCIATION

The Air Transport Association of America (ATA), the trade association that represents all major U. S. airlines, recently contracted with Consolidated Safety Services, Inc. (CSS) to perform a study of airline cabin air quality aboard several aircraft types and air carriers. The study was designed to evaluate the quality of transport aircraft cabin air aboard two types of "older" aircraft and two types of "newer" aircraft (each type designed for different ventilation configurations) currently in use by eight U. S. air carriers. A total of 35 commercial airline flight segments formed the basis of the study. CSS collected data during at least eight flights for each type of aircraft and four flights for each commercial airline. Cabin air monitoring was conducted without the prior knowledge of individual airline crews. Flights for evaluation were selected solely by CSS, without consultation with ATA or the air carriers.

The study represents the most comprehensive evaluation to date of airliner air quality and employed the most advanced, state-of-the art air monitoring devices available.

METHODOLOGY

SECTION 2: METHODOLOGY

A. FLIGHT SELECTION

The McDonnell Douglas DC-9 and the Boeing 727 were evaluated as representative of aircraft that were designed to provide for 100 percent intake of fresh air (older generation aircraft configuration) while the McDonnell Douglas MD-80 and the Boeing 757 were evaluated as representative of aircraft designed to provide for a combination of fresh air and recirculated air (newer generation aircraft configuration).

The study was designed to collect data aboard eight flight segments for each type of aircraft studied. In all, 35 flight segments were used for data collection (three additional flight segments were added to accommodate scheduling problems, or technical data collection difficulties during previous flights).

In addition, the study was designed to collect data from a similar number of aircraft operated in scheduled service by each of the following airlines, which were selected by CSS without consultation with ATA or its members:

- Alaska
- American
- Continental
- Delta
- Northwest
- TWA
- United
- USAir

Flight origin and destination were selected based upon aircraft and air carrier availability and encompassed locations throughout the continental United States. Individual flight durations ranged from 40 minutes to 5 hours and 30 minutes. Data were collected from different locations on different flights on each type of aircraft: two in first class, two in the front section of coach class, two in the middle section of coach class and two in the rear section of coach class.

The passenger load factor of flights ranged from 31% to 100% with an average of 74%. The average passenger load factor for March, 1994 for all airlines was 67%. Appendix A provides a detailed listing of each of the 35 flights monitored by CSS including type of aircraft, number of seats, number of first class passengers, number of coach passengers, load factor, seat number, take-off time, landing time, and duration of flight.

B. SAMPLING STRATEGY AND INSTRUMENTATION

Where possible, direct reading instruments were used to monitor environmental parameters and contaminants so that a complete flight duration profile could be obtained. In accordance with individual airline flight announcements, data collection instrumentation was not removed from compartment storage and turned on until the aircraft reached an altitude of 10,000 feet.

Two types of indoor air quality factors were evaluated: contaminants and environmental parameters. Indoor air contaminants measured included respirable particulates, biological organisms (bacterial and fungal), and volatile organic compounds. Environmental parameters measured included carbon dioxide levels, relative humidity, temperature and noise.

The following provides a brief description of the instrumentation and methods used to collect data during this study.

B.1 Carbon Dioxide

Average carbon dioxide levels during the entire flight were recorded each minute using the Metrosonics aq-501 Air Quality Monitor. The instrument uses a non-dispersive infrared detector that is accurate to plus or minus 3%. The instrument was calibrated using nitrogen as a zeroing gas and 1000 ppm CO_2 as a span gas. Data was collected into a data logger which was subsequently downloaded into a database immediately following completion of each flight. Data was reported as parts per million (ppm), for individual readings and average per flight segment.

B.2 Temperature

Average temperature levels during the entire flight were recorded each minute using the Metrosonics aq-501 Air Quality Monitor. The instrument uses an RTD detector that is accurate to plus or minus 0.9 °F. Data was collected into a data logger which was subsequently downloaded into a database immediately following completion of each flight. Data was reported in °F, for individual readings and average per flight segment.

B.3 Relative Humidity

Average relative humidity levels during the entire flight were recorded each minute using the Metrosonics aq-501 Air Quality Monitor. The instrument uses a capacitive detector that is accurate to plus or minus 3%. Data was collected into a data logger which was subsequently downloaded into a database immediately following completion of each flight. Data was reported in percent relative humidity, for individual readings and average per flight segment.

B.4 Particulates

Average particulate levels were recorded each minute during the entire flight using a HAM Aerosol Monitor. The instrument measures particulates based on the light scattering properties of particles. Data was collected into the data logger for the aq-501 (described above) which was subsequently downloaded into a database immediately following completion of each flight. Data was reported in micrograms per cubic meter of air ($\mu g/m^3$), for total and average readings per flight segment.

B.5 Total Volatile Organic Compounds

Average total volatile organic compound levels were recorded every 15 seconds, during the entire flight, using a Photovac Microtip. The instrument uses a photoionization detector that is accurate to plus or minus 2 ppm. The instrument was calibrated using a 100 ppm isobutylene span gas. All data collected during each flight were maintained in a data logger, which were subsequently downloaded into a database immediately following completion of each flight. Data were reported as parts per million (ppm) of total volatile organic compounds.

Levels of total volatile organic compounds were monitored throughout the flight. In the event a "peak" was noted, an additional air sample was collected into a charcoal tube using a high flow sampling pump.

B.6 Noise Levels

Noise levels were monitored, during the entire flight duration, using a CEL-281 Computing Noise Dosimeter. The instrument was calibrated using a CEL-282 acoustical calibrator. Data were collected into a data logger which was subsequently downloaded into a database immediately following completion of each flight. Data were reported in average decibels (dBA) per flight segment.

B.7 Biological Contaminants

Biological samples were collected during this study to examine the extent to which bacterial and fungal contamination is produced, or remains in the cabin environment. Viral contamination was not assessed as current technology does not permit for the sampling of viruses in the air. Unlike bacterial and fungal contaminants, viruses do not not replicate on artifical sampling media and need living host systems such as human or animal cells. Since biological air samples in the field are taken on prepared artificial media, sampling for viruses is technically impracticle at this time.

Bacteria and fungal samples were collected using an SAS Portable Compact Air Sampler with a sampling head having sampling ports with a range of 0.5 microns diameter (respirable range). RODAC sampling plates containing standard platecount agar for bacterial samples and malt media agar for fungal samples were loaded into the sampler. Air was drawn across the sampling plates for a total approximate air volume of 123 liters.

All samples were refrigerated and shipped to American Medical Laboratories, Inc. for subsequent analysis. Colony counts were conducted to quantify bacteria and fungus in the air. Cultures were further analyzed as to the genus and species (where possible) of bacteria and fungus isolated.

C. EVALUATION STANDARDS

Indoor air quality standards developed by two recognized organizations concerned with indoor environments were used as the basis for evaluation of data collected during this study.

C.1 Occupational Safety and Health Administration (OSHA)

OSHA is a federal regulatory agency under the U. S. Department of Labor tasked with developing health and safety standards for the protection of workers. Through extensive research, OSHA has developed permissible exposure limits (PELs) for a variety of workplace contaminants and noise. PELs for individual chemicals are codified and listed in 29 CFR 1910.1000. PELs are exposure limits, usually expressed in parts per million (ppm) or milligrams per cubic meter (mg/m3) of air, that the average worker can be exposed to for 8 hours a day and 40 hours per week without experiencing adverse health effects.

C.2 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

ASHRAE is a voluntary organization of technically qualified members that develop standards to assist industry and the public. The creation of ASHRAE Standards is determined by the need for them, and conformance to them is completely voluntary. ASHRAE Standard 62-1989, Ventilation for Acceptable Indoor Air Quality, was developed "to specify minimum ventilation rates and indoor air quality that will be acceptable to human occupants and are intended to minimize the potential for adverse health risks." The ASHRAE standard deals with the design of a ventilation system as it is affected by outside air quality, ventilation system design, system operation and maintenance and the presence of sources of contaminants and the strength of the sources, so that an acceptable level of indoor air quality can be provided.

In addition, ASHRAE provides recommendations for environmental parameters such as temperature control in aircraft cabins under the "Air Conditioning and Heating Performance Applications Handbook".

RESULTS AND DISCUSSION

SECTION 3: RESULTS AND DISCUSSION

A. CONTAMINANTS

A.1 Respirable Particulates

Airborne particulates composed of natural and synthetic materials are commonly found in indoor environments. Examples of airborne particulates include pollen, dust, hair, skin, fibers, microorganisms, and small pieces of frayed building materials including gypsum, fiberglass, and cellulose. If large particles are inhaled, they are trapped in the upper respiratory system and as a result are not a health hazard. Respirable particles, i.e., those not trapped (particles <10 microns), however, can penetrate deep into the lungs and pose a potential health hazard.

OSHA has developed PELs for a variety of respirable particles linked to health problems including silica, cellulose, gypsum, various metals and particles not otherwise regulated. The PEL's for specfic particulates are useful for evaluating exposures in industries where sources are present that are known to emit hazardous particulates. The PEL for particles not otherwise regulated is useful for evaluating exposures when it is unlikely that OSHA regulated specific particulates are present. It is unlikely that the probable sources of particulates on aircraft would emit hazardous levels of the OSHA regulated specific particulates .

Summary results of total respirable particulate sampling during this study were as follows:

TOTAL RESPIRABLE PARTICULATES	
PARAMETER	**AVERAGE NUMBER ($\mu g/m^3$)**
All Aircraft	170.1
<1 hour flight duration	178.3
1-2 hour flight duration	152.3
>2 hour flight duration	172.8
Boeing 727 - ALL	174.5
First Class	171.5
Coach Class	176.6
DC-9 - ALL	179.7
First Class	178.5*
Coach Class	180.0
McDonnell MD-80 - ALL	176.5
First Class	204.3*
Coach Class	181.7
Boeing 757 - ALL	179.7
First Class	172.1
Coach Class	182.2

* Data for one flight only

Average total respirable particulates for the 35 flight segments was 176.5 $\mu g/m^3$. The range of respirable particles encountered during the Airline Cabin Air Quality Study was approximately 140 $\mu g/m^3$ to 200 $\mu g/m^3$, well below the OSHA permissible exposure limit (PEL) for respirable particles not otherwise regulated of 5000 $\mu g/m^3$. Therefore, the aircraft cabin environment is relatively free of dust and other particles which are likely to cause health effects.

A.2 Biological Contaminants

There are currently no indoor air quality standards for airborne bacteria and/or fungus. The National Institute of Occupational Safety and Health (NIOSH) has recommended that corrective action be taken if airborne bacterial and/or fungal counts are greater than 1,000 CFU/m^3 (colony forming units per cubic meter of air). This recommended level is only used as a guideline however, since individuals who may be sensitized to specific genus/species of bacteria or fungus (e.g., allergies) can have adverse physiological effects at very low airborne concentrations in any environment.

Most indoor biological contaminants are commonly saprophytic organisms, i.e., obtaining nourishment from dissolving organic material, are not pathogenic, i.e., capable of causing disease, and are routinely associated with people or normal environmental sources such as plants, animals, soil, and water.

Summary results of biological contaminant sampling during this study were as follows:

BIOLOGICAL CONTAMINANTS - All Aircraft				
PARAMETER	Total Fungal Count (Range) CFU/m³	Comments	Total Bacterial Count (Range) CFU/m³	Comments
All Aircraft - Early	0-110		0-360	
All Aircraft - Late	0-49		0-270	
First Class - Early	0-57		0-170	
First Class - Late	0		0-110	
Coach Class - Early	0-110		0-360	
Coach Class - Late	0-49		0-270	

BIOLOGICAL CONTAMINANTS* - Boeing 727				
PARAMETER	**Total Fungal Count (Range) CFU/m^3**	**Comments**	**Total Bacterial Count (Range) CFU/m^3**	**Comments**
Boeing 727 - All - Early	0-8	The following fungal organisms were isolated from samples obtained aboard Boeing 727 aircraft: *Penicillium sp.* *Paecilomyces sp.* *Drechslera sp.*	24-170	The following bacterial organisms were siolated from samples obtained aboard Boeing 727 aircraft: *Coagulase neg. staphylococcus* *Acinetobacter lwoffi* *Pseudommonas vessicularis* *Sphingomonas spiritivorum* *Bacillus sp.* *Micrococcus sp.* *Diphtheroids* *Pasteurrella sp.* *Xanthomonas maltophilia*
Boeing 727 - All - Late	0-16		0-110	
First Class - Early	0		49-170	
First Class - Late	0		0-110	
Coach Class - Early	0-8		24-170	
Coach Class - Late	0-16		41-110	

BIOLOGICAL CONTAMINANTS - McDonnell Douglas DC-9				
PARAMETER	**Total Fungal Count (Range) CFU/m³**	**Comments**	**Total Bacterial Count (Range) CFU/m³**	**Comments**
McDonnell DC-9 - All - Early	0-57	The following fungal organisms were isolated from samples obtained aboard McDonnell Douglas DC-9 aircraft: *Aspergillus niger* *Pencillium sp.* *Rhodotorula sp.* *Phaeococcomyces sp.* *Epicoccum sp.* *Rhizopus sp.* *Aspergillus sp.*	8-150	The following bacterial organisms were isolated from samples obtained aboard McDonnell Douglas DC-9 aircraft: *Coagulase neg. staphylococcus* *Citrobacter freundii* *Bacillus sp.* *Micrococcus sp.* *Diphtheroids* *Enterobacter sp.* *Ochrobactrum anthropi*
McDonnell DC-9 - All - Late	0-49		16-150	
First Class - Early	8-57		8	
First Class - Late	0		24-32	
Coach Class -Early	0-8		24-150	
Coach Class - Late	0-49		16-150	

<table>
<tr><th colspan="5">BIOLOGICAL CONTAMINANTS - McDonnell Douglas MD-80</th></tr>
<tr><th>PARAMETER</th><th>Total Fungal Count (Range) CFU/m³</th><th>Comments</th><th>Total Bacterial Count (Range) CFU/m³</th><th>Comments</th></tr>
<tr><td>McDonnell MD-80 - All - Early</td><td>0-8</td><td rowspan="6">The following fungal organisms were isolated from samples obtained aboard McDonnell Douglas MD-80 aircraft:

Cladosporium sp.
Geotrichum sp.
Penicillium sp.
Drechslera sp.
Currularia sp.
Rhodotorula sp.
Aspergillus niger
Aureobasidium pollulans
Acremonium sp.
Bispora sp.</td><td>0-190</td><td rowspan="6">The following fungal organisms were isolated from samples aboard McDonnell Douglas MD-80 Boeing 757 aircraft:

Coagulase neg. Staphylococcus
Micrococcus sp.
Acinetobacter lwoffi
Acinetobacter sp.
Bacillus sp.
Enterobacter Agglomerans
Pseudomonas stutzeri
Acinetobacter baumannii</td></tr>
<tr><td>McDonnell MD-80 -All - Late</td><td>0-16</td><td>0-270</td></tr>
<tr><td>First Class - Early</td><td>0</td><td>0</td></tr>
<tr><td>First Class - Late</td><td>0</td><td>0</td></tr>
<tr><td>Coach Class - Early</td><td>0-8</td><td>0-190</td></tr>
<tr><td>Coach Class - Late</td><td>0-16</td><td>0-270</td></tr>
</table>

<table>
<tr><th colspan="5">BIOLOGICAL CONTAMINANTS - Boeing 757</th></tr>
<tr><th>PARAMETER</th><th>Total Fungal Count (Range) CFU/m³</th><th>Comments</th><th>Total Bacterial Count (Range) CFU/m³</th><th>Comments</th></tr>
<tr><td>Boeing 757 - All - Early</td><td>0-110</td><td rowspan="6">The following fungal organisms were isolated from samples obtained aboard Boeing 757 aircraft:

Epicoccum sp.

Aspergillus sp.

Rhodotorula sp.

Cladosporium sp.

Penicillium sp.

Cryptococcus sp., not neoformans</td><td>0-360</td><td rowspan="6">The following bacterial organisms were isolated from samples obtained aboard Boeing 757 aircraft:

Coagulase neg. staphylococcus

Bacillus sp.

Diptheroids

Micrococcus sp.

Staphylococcus aureus

Acinetobacter baumanii</td></tr>
<tr><td>Boeing 757 - All - Late</td><td>0-8</td><td>0-240</td></tr>
<tr><td>First Class - Early</td><td>0-8</td><td>33-110</td></tr>
<tr><td>First Class - Late</td><td>0-8</td><td>24-81</td></tr>
<tr><td>Coach Class - Early</td><td>0-110</td><td>0-360</td></tr>
<tr><td>Coach Class - Late</td><td>0-8</td><td>0-240</td></tr>
</table>

The results of this study indicate that, regardless of the type of aircraft or flight duration, levels of airborne microorganisms remain well below NIOSH recommended levels. This is to be expected since organisms would not enter the cabin through the aircraft's fresh air intake since the air at cruising altitudes is virtually free of biological contamination. Also, high efficiency particulate air (HEPA) filtration systems aboard some aircraft far exceed the efficiency of common building filtration systems, and remove biological contaminants from recirculated air. HEPA filters are rated between 95-99.97% efficient

for particles of 0.3 microns in diameter, with the higher efficiency rating for True HEPA filters and the lower efficiency rating for HEPA-type filters.

No bacterial or fungal respiratory pathogens were isolated during this study. As discussed earlier in the Methodology Section of this report, virus sampling was not conducted because viruses will not replicate on standard media used for field sampling of biological contaminants). Nearly all the bacterial organisms isolated are associated with normal human skin flora and are most likely liberated by the passengers and flight crew of the airline cabin. For example, Micrococcus and Staphylococcus are related bacterial organisms and are common inhabitants of the skin and mucous membranes. Bacillus sp. is a commonly found organism, present worldwide as a soil saprophyte. Identified fungal species are commonly found in indoor environments and are normally isolated from soil, water and other outdoor sources. Aspergillus sp. are common saprophytic fungi, found in the air.

A.3 Total Volatile Organic Compounds

Volatile organic compounds (VOCs) are a very large group of substances which can exist in the gaseous state at room temperature. Over 500 different types of volatile organics have been identified in various studies of indoor air. Acute health effects associated with an overexposure to VOCs are often difficult to detect but may include respiratory system irritation, headache, dizziness, and lethargy.

Sources of VOC emissions into the indoor environment are as numerous and varied as the VOCs. Examples of emission sources include building materials, paints, cleaning compounds and solvents, pesticides, food, alcoholic beverages, and people.

OSHA has established PELs for a large number of VOCs. The established PEL is based on the toxicity of the individual VOC. OSHA has also established procedures for evaluating exposure to multiple regulated chemicals.

Summary results of total volatile organic compounds sampled during this study were as follows:

TOTAL VOLATILE ORGANIC COMPOUNDS	
PARAMETER	TOTAL VOCs (ppm)
All Aircraft	2.2
<1 hour flight duration	0.5
1-2 hour flight duration	2.1
>2 hour flight duration	3.2
Boeing 727 - ALL	2.9
First Class	1.7
Coach Class	5.9
DC-9 - ALL	0.7
First Class	2.0
Coach Class	0.2
McDonnell MD-80 - ALL	2.7
First Class	3.1
Coach Class	2.6
Boeing 757 - ALL	2.3
First Class	3.9
Coach Class	2.4

During this study, total VOCs were monitored continuously. The relatively low levels of VOCs recorded on the flights and the probable sources of these VOCs indicate that the VOCs commonly found in airline cabin air are not likely to cause in any adverse health effects. During the initial phase of each flight segment, VOC levels were very low (almost always 0). As food and beverages were served the level of total VOCs also increased. This suggests that most VOCs were emitted from the food, alcoholic beverages, and people.

Because of the large number of VOCs found in the indoor environment, it is difficult to monitor for specific compounds. In one episode during the study, when total VOCs approached 10 ppm, an air sample was collected using a sampling pump and charcoal tube. The sample was submitted to an analytical laboratory accredited by the American Industrial Hygiene Association (AIHA) and analyzed using a gas chromatograph (GC) with a flame ionization detector (FID). Analysis was performed to detect eleven different VOCs. Results of the analysis revealed that all eleven VOCs were below detectable levels.

B. ENVIRONMENTAL PARAMETERS

B.1 Carbon Dioxide

Carbon dioxide is a colorless, odorless gas which is produced by human metabolism, and is exhaled through the lungs. Carbon Dioxide levels in the indoor environment are indicative of ventilation system performance. Significant elevated levels (above the OSHA limit of 5,000 ppm) of carbon dioxide can cause lethargy, dizziness, rapid heart rate, and in extremely high concentrations, unconsciousness and death.

Lack of oxygen resulting from extreme levels of carbon dioxide (levels exceeding 60,000 ppm) are associated with the most severe consequences on human life and health.

According to ASHRAE, the recommended levels for carbon dioxide in most indoor spaces is below 1,000 parts per million (ppm). The 1,000 ppm level is not associated with adverse health effects. This level has been established for occupied spaces with light to moderate human activity and is designed to remove normal expected levels of common indoor air contaminants (although slightly higher levels have typically been measured in office buildings, shopping malls and other public spaces).

Summary results of carbon dioxide sampling during this study were as follows:

CARBON DIOXIDE	
PARAMETER	**AVERAGE CONCENTRATION (ppm)**
All Aircraft	1162
<1 hour flight duration	1353
1-2 hour flight duration	1107
>2 hour flight duration	1163
Boeing 727 - ALL	1148
First Class	1007
Coach Class	1232
DC-9 - ALL	992
First Class	749
Coach Class	1073
McDonnell MD-80 - ALL	1192
First Class	965
Coach Class	1243
Boeing 757 - ALL	1316
First Class	1079
Coach Class	1395

The average carbon dioxide level measured for all flight segments was 1162 ppm, well below the OSHA PEL of 5,000 ppm. As carbon dioxide levels are directly related to occupancy and human respiration, the lower average carbon dioxide levels measured in first class seating was most likely attributed to the fewer passengers per cubic foot of cabin area rather than to any differential in air circulation. Also, the greater load factor

(a 74% average for this study versus a 67% average for the month of March) may have resulted in slightly higher average carbon dioxide levels for this study than would be expected on the average flight.

The data collected indicates that the level of carbon dioxide, while slightly above the ASHRAE recommended level for indoor environments, does not present a risk of adverse health effects to airline passengers or crew.

While carbon dioxide can be used as an indicator of ventilation efficiency, it is not always the sole determining factor. It is therefore important to evaluate carbon dioxide levels as a part of a complex system, in conjunction with other indoor air quality indicators. For example, it can be assumed that adequate ventilation for removal of indoor contaminants is provided, even at the slightly higher level of carbon dioxide, since airline cabin levels of biological contaminants were found to be significantly lower than those exhibited in other indoor environments. Since the ASHRAE standard is designed to ensure reduction of commonly found indoor contaminant levels, the data indicate that levels of airline cabin contaminants do not require increased airflow and are adequately removed by the lower indicated ventilation rates.

B.2 Relative Humidity

Relative humidity is a measurement of the percentage of water vapor present in air with respect to the amount the air can hold at a given temperature and pressure. ASHRAE recommends that the range of relative humidity in occupied spaces be maintained between 30 and 60 percent. In addition, OSHA has recently proposed that relative humidity be maintained below 60 percent. High humidity levels are not often associated with adverse human health effects, but rather can be an indication of potential breeding grounds for microorganisms. Low humidity can be associated with discomfort of some

occupants and can produce short-term symptoms such as dry mucous membranes and sore throat. These symptoms can be eliminated through intake of fluids.

Summary results of relative humidity sampling during this study were as follows:

RELATIVE HUMIDITY	
PARAMETER	**AVERAGE RELATIVE HUMIDITY (%)**
All Aircraft	16.8
<1 hour flight duration	21.8
1-2 hour flight duration	16.2
>2 hour flight duration	15.6
Boeing 727	16.6
First Class	15.4
Coach Class	17.3
DC-9	16.3
First Class	12.8
Coach Class	17.5
McDonnell MD-80	17.0
First Class	12.3
Coach Class	18.1
Boeing 757	17.1
First Class	13.9
Coach Class	18.2

Average relative humidity levels on the 35 flight segments was 16.8. As with carbon dioxide and other environmental parameters relative humidity levels must be appropriately considered as only part of a comprehensive indoor air quality evaluation. As is indicated by the data in this study, the lower relative humidity levels found in airline cabins provide the benefit of reduced microbial contamination. Although the levels found were below that recommended by ASHRAE (30-60% relative humidity), they are not associated with health effects and are similar to arid environments in areas like Arizona and Colorado. Further, the low humidity levels provide an environment that greatly inhibits the growth of microorganisms that can cause serious health problems.

Aircraft are not equipped with humidification systems because such systems add significantly to the weight of the aircraft, and more importantly could create a moist, enclosed environment conducive to excessive growth of mold, mildew and fungus, as well as encouraging aircraft corrosion, which could pose other safety risks. The low relative humidity rates observed during this study are natural, as outside air taken into aircraft ventilation systems at cruising altitudes is very cold and has little water vapor.

It should be noted however, that since low relative humidity levels are not comfortable for every occupant, passengers and crew should be encouraged to eliminate symptoms through proper fluid intake, as would be expected in similarly arid climates.

B.3 Temperature

Thermal comfort is provided to individuals in occupied spaces through careful temperature control which does not vary widely, regardless of the outside temperature. While temperature is not normally a factor in producing acute or chronic health effects (except under extreme conditions), changes in overall temperature variance can be an indicator of inadequate ventilation. ASHRAE recommends that during cruise the air

conditioning system should maintain an average cabin temperature of 75°F with a full passenger load. During ground operations, the system should be capable of maintaining an average cabin temperature of no higher than 80°F.

Summary results of temperature sampling during this study were as follows:

TEMPERATURE		
PARAMETER	AVERAGE (°F)	CHANGE (°F)
All Aircraft	75.9	5.5
<1 hour flight duration	77.4	4.7
1-2 hour flight duration	75.1	4.7
>2 hour flight duration	76.5	7.3
Boeing 727	75.8	5.6
First Class	74.6	4.9
Coach Class	76.5	6.0
DC-9	74.0	4.3
First Class	72.8	3.1
Coach Class	74.3	4.8
McDonnell MD-80	77.2	8.2
First Class	77.2	14.6*
Coach Class	77.2	6.8
Boeing 757	76.5	3.8
First Class	72.1	4.8
Coach Class	77.9	3.5

*reflects an extreme temperature difference of 26°F in one flight only

Average temperature levels on the 35 flight segments was 75.9°F. Temperature variation during flights averaged 5.5°F, which is insignificant and does not indicate inadequacies in ventilation heating and cooling system designs. None of the temperature data recorded would be associated with adverse health effects in passengers or flight crews.

B.4 Noise

Exposure to high noise levels for extended periods of time can result in hearing loss and cause other adverse health effects. The OSHA PEL for noise is 90 dBA.

Summary results of the noise sampling during this study were as follows:

AVERAGE NOISE LEVELS	
PARAMETER	**AVERAGE LEVEL (dBA)**
All Aircraft	71.6
<1 hour flight duration	67.8
1-2 hour flight duration	75.1
>2 hour flight duration	70.0
Boeing 727 - ALL	73.1
First Class	68.5
Coach Class	77.6
DC-9 - ALL	78.2
First Class	82.4*
Coach Class	77.3
McDonnell MD-80 - ALL	74.8
First Class	74.1
Coach Class	75.1
Boeing 757 - ALL	60.3
First Class	**
Coach Class	60.3

* Data for one flight only
** No data

The average noise level on the 35 flight segments was 71.6 dBA. The data indicate that noise levels aboard aircraft are well below the OSHA PEL and are not likely to cause adverse health effects. It is also quite apparent that the newer generation of aircraft provide a quieter environment.

CONCLUSIONS

SECTION 4: CONCLUSIONS

Evaluation of indoor air quality is based upon a careful analysis and understanding of the relationship between a number of influencing factors. Results from the monitoring of a single factor are an insufficient basis from which to draw any conclusions. As such, this study examined a number of environmental parameters and contaminant levels to assess the overall air quality of airliner cabins.

Fresh air entering the airline cabin at cruising altitudes, while relatively dry, is cleaner than air that enters most occupied spaces on the ground. Thus, common biological and chemical pollutants which are produced outside do not add to those contaminants produced from inside occupants, activities and materials. In addition, pollutants which are produced from inside the cabin are efficiently removed through cabin ventilation and filtration systems. While older generation aircraft have the benefit of quick removal of environmental contaminants because 100 percent of the air brought into the cabin is exhausted, the trend is for newer generation aircraft to recirculate air through filters which are more effective than common building filtration systems.

The data in this study confirmed that both generations of aircraft exceed the requirements for maintaining a healthy air quality environment. The findings, in summary, include:

- Air particulate and contaminant levels were low enough to indicate an efficient air filtration system.

- VOC-measured levels, even at their highest during food and beverage service, were never at a level to cause adverse health effects to passengers and crew.

- Carbon dioxide levels easily met OSHA standards. While sometimes exceeding ASHRAE-recommended levels, carbon dioxide levels when combined with other measurements indicate an adequate ventilation of the aircraft and pose no health risk.

- Relative humidity of in-cabin air is low, but that is to be expected because of the extremely dry air from the atmosphere that is being circulated through the cabin. Any passenger discomfort associated with low humidity levels can be easily offset by passenger and crew intake of fluids such as water or juice. In addition, the low humidity assists in keeping the cabin relatively free of particles and microorganisms.

- Temperature variation does not indicate a problem with aircraft ventilation systems.

- Biological contaminants are low -- especially for a confined space often crowded with people -- another indicator of an efficient and adequate air ventilation system.

- In-cabin noise levels are well below OSHA noise exposure limits.

APPENDIX A: FLIGHT INFORMATION

APPENDIX A. AIRLINE CABIN AIR QUALITY STUDY FLIGHT INFORMATION

AIRCRAFT.	# OF SEATS.	1ST CLASS.	COACH...	LOAD FACTOR.	SEAT #.	TAKE-OFF..	LANDING...	FLIGHT.. DURATION
MD80	135	11	66	57.04	5A	12:49:00PM	03:41:00PM	2:52
MD80	139	14	124	99.28	9E	06:30:00PM	07:28:00PM	0:58
DC9	98	8	89	98.98	24E	12:05:00PM	12:55:00PM	0:50
MD80	153	12	92	67.97	9E	02:50:00PM	05:16:00PM	2:26
DC9	77	7	53	77.92	16E	09:59:00AM	11:19:00AM	1:20
757	184	13	157	92.39	12E	12:50:00PM	05:13:00PM	4:23
MD80	135	5	109	84.44	24B	07:26:00PM	09:54:00PM	2:28
757	180	14	123	76.11	26E	10:32:00AM	12:49:00PM	2:17
MD80	138	2	23	18.12	13B	10:41:00PM	11:50:00PM	1:09
757	181	24	154	98.34	37B	09:39:00AM	11:11:00AM	1:32
MD80	138	14	123	99.28	38B	12:21:00PM	01:21:00PM	1:00
727	132	12	109	91.67	28E	09:53:00AM	12:03:00PM	2:10
DC9	122	12	101	92.62	24E	02:41:00PM	03:47:00PM	1:06
DC9	103	5	35	38.83	7E	12:06:00PM	01:10:00PM	1:04
757	185	14	170	99.46	17B	03:55:00PM	04:50:00PM	0:55
DC9	103	8	58	64.08	14E	08:24:00PM	10:00:00PM	1:36
727	134	12	57	51.49	1A	12:05:00PM	01:46:00PM	1:41
727	124	6	33	31.45	1A	02:45:00PM	03:10:00PM	0:25
727	124	12	75	70.16	19B	05:31:00PM	06:11:00PM	0:40
MD80	153	13	63	49.67	4E	07:01:00AM	10:09:00AM	3:08
DC9	103	7	50	55.34	2E	11:16:00AM	12:56:00PM	1:40
MD80	152	1	63	42.11	18E	10:23:00AM	12:59:00PM	2:36
757	188	18	76	50.00	30B	03:05:00PM	04:50:00PM	1:45
DC9	103	6	56	60.19	2A	07:21:00PM	08:28:00PM	1:07
757	188	23	151	92.55	5A	12:19:00PM	05:49:00PM	5:30
MD80	138	9	87	69.57	25B	08:06:00PM	09:57:00PM	1:51
MD80	138	8	98	76.81	32B	01:11:00PM	03:21:00PM	2:10
727	147	11	135	99.32	4A	06:01:00PM	07:28:00PM	1:27
757	188	23	111	71.28	5A	08:49:00PM	11:22:00PM	2:33
DC9	78	4	26	38.46	3E	09:58:00AM	11:04:00AM	1:06
727	146	12	111	84.25	6E	03:17:00PM	04:57:00PM	1:40
727	148	12	112	83.78	15B	06:18:00PM	09:33:00PM	3:15
MD80	138	9	127	98.55	14F	11:23:00AM	01:59:00PM	2:36
727	147	12	122	91.16	24E	05:05:00PM	07:04:00PM	1:59
757	182	23	158	99.45	18B	08:25:00PM	10:59:00PM	2:31

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Comfort & Health In Airline Travel

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Air Transport Association of America
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Airline travel has become a way of life for many Americans. Millions of passengers travel by airplane each day for business and pleasure. While fast and convenient air travel has become routine for many, the U.S. airline industry wants passengers to remember that despite the comforts of modern-day air transportation, it can sometimes be taxing, as passengers often are traveling across time zones at altitudes of up to 40,000 feet above sea level.

The Air Transport Association prepared this brochure to explain the symptoms air travelers commonly experience, the design and operation of aircraft environmental systems, and how passengers can best prepare for a comfortable and healthy trip. Passengers with specific health conditions should always consult a doctor before flying, but the suggestions in this booklet can help make traveling by air more comfortable.

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Cabin Air Quality

Aircraft environmental control systems vary based on the year the aircraft was manufactured. For instance, the Boeing 727 and McDonnell Douglas DC-9 have an environmental control system that uses 100% fresh outside air. Newer airplanes such as the Boeing 767, Airbus A320 and McDonnell Douglas MD-11 have environmental control systems that use a combination of fresh outside air and filtered, recirculated air to maintain the cabin air quality.

In both types of environmental control systems, outside fresh air for the cabin comes from the aircraft's jet engine compressors. The air is very hot, so the portion drawn off for the cabin is cooled by heat exchangers and air conditioning units and is directed to the cabin or a mixing chamber if the air is to be mixed with recirculated filtered air.

For aircraft with recirculation systems, the combined fresh and filtered air is then directed to the cabin and distributed through overhead outlets that extend the full length of the cabin. The cabin air flows downward in a circular pattern, exiting through floor grills on either side of the cabin. Air flow is continuous which effectively removes particles and odors.

On airplanes with fresh air only systems, all the air is vented overboard a replaced with new outside air. Recirculation systems vent approximately one-half of the combined air mixture through the floor grills from air before returning to the cabin.

The filters are highly effective at safeguarding the quality of the cabin air. Most airplane filter assemblies contain a standard filter, like the ones used in home and office ventilation systems, as well as a high efficiency filter similar to those used to keep the air clean in hospitals. Tests have shown that the high efficiency filters are very effective at capturing microscopic particles as small as bacteria and viruses.

All of the air that is recirculated into the cabin must pass through the filter assemblies. As the filters capture particles they actually become even more effective at trapping smaller particles. Filters are replaced at regular intervals to maintain air quality standards and air flow capability.

Key characteristics of the cabin air system

- Air circulation is continuous. Air is always coming into and out of the cabin.
- All of the cabin air is replaced with a mixture of outside fresh and filtered air 20 to 30 times per hour.

Outside fresh air mixing replenishes the cabin air constantly. The fresh air content keeps carbon dioxide and other substance levels well within applicable standards and replaces oxygen faster than the rate at which it is consumed. Replenishment assures that the recirculated air does not continuously circulate but is rapidly diluted and replaced with outside air. Each passenger is supplied with over 100 times the oxygen concentration in the air that his/her body requires.

Compared to other modes of transportation, office buildings and other large enclosed spaces, today's aircraft provide a cabin environment that is superior in many respects. For example, in the peak heating and cooling seasons, most office buildings provide a far lower percentage of fresh air - often in the range of 20%. In addition, buildings typically have a much lower air change rate and they are seldom equipped with high-efficiency filters.

One further advantage for airplane passengers is that the outside air that freshens cabins at higher altitudes is much cleaner than what is available for ventilating buildings and modes of ground transportation in more polluted areas.

Recent studies sponsored by the U.S. Government and others conducted by aircraft manufacturers and airlines have confirmed the overall safety and high

samples on 92 randomly selected airline flights were taken In all samples, the levels of pollutants and fungous bacteria were found to be the same or lower than such levels encountered in normal indoor environments The level of carbon dioxide was also found to average less than one third the limit recommended by the American Conference of Governmental Industrial Hygienists

A 1994 study conducted by Consolidated Safety Services, Inc. confirmed that both generations of aircraft exceed the requirements for maintaining a healthy air quality environment The findings indicated that.

- Air particulate and contaminant levels were low enough to indicate an efficient air filtration system.
- Volatile organic compounds even at the highest levels during food and beverage service, were never at a level to cause adverse effects to passengers and crew.
- Carbon dioxide levels easily met Occupational Safety and Health Administration (OSHA) standards, indicating an adequate ventilation system and posing no health risk.
- Relative humidity of in-cabin air is low, which is expected because of the dry air from the atmosphere that is brought into the cabin Any discomfort caused by low humidity levels can be easily offset by passenger and crew intake of fluids such as water or juice.
- Temperature variation does not indicate a problem with aircraft ventilation systems
- Biological contaminants are low -- especially for a confined space -- another indicator of an efficient and adequate air ventilation system.
- In-cabin noise levels are well below OSHA noise exposure limits

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Travel Tips
For Improved Passenger Comfort

Despite the highly effective cabin environmental control systems the airplane cabin is still a unique environment -- cabin air-humidity levels are lower than those to which most passengers are accustomed, passengers can be seated for long periods of time and the cabin is pressurized at an altitude of up to 8,000 feet Another unique element of airline travel is the ability to quickly travel through time zones which can to the typical passenger However, these are some guidelines to follow that can considerably improve your comfort level during and after a flight

Dehydration

The most common complaints of airline passengers, such as dizziness and headaches, are the result of low humidity and dehydration Humidity levels of less than 20% are common in the passenger cabin due to the low humidity levels of the outside air that is taken in and supplied to the cabin

- Start building up your body fluid level before your trip by increasing your daily consumption of water and juices
- During the flight, drink water and juices frequently Try to consume 8 ounces of fluid per each hour of flight Use nose and eye drops as necessary
- Before and during flight avoid over consumption of alcohol, coffee, tea and soft drinks with caffeine, which act as diuretics and can increase dehydration
- Remove contact lenses and wear glasses.
- Use a skin moisturizer or water atomizer to refresh the skin
- If you have allergies or asthma, drier air could aggravate your symptoms You may want to use a decongestant prior to the flight -- consult your physician for specifics
- Take a hot shower soon after arrival to rehydrate your body

Altitude Pressure

A key feature of modern commercial aircraft that makes air travel comfortable for the millions of passengers that fly is the aircraft environmental control system. This system controls air flow, distribution, filtration, cabin pressure and temperature At altitudes of up to 40,000 feet, the airplane must be pressurized to enable passengers to breathe normally Cabin pressure is designed to equal an altitude that never exceeds 8,000 feet

The cabin pressure and normal rates of change in cabin pressure during climb and descent are such that they do not pose a problem for the typical passenger. However, persons suffering from upper respiratory or sinus infections, obstructive pulmonary diseases, anemia or certain cardiovascular conditions could experience discomfort. Children and infants might experience some discomfort in their ears due to the change of altitude and cabin pressure especially

If you have a cold or flu, hay fever or sinus trouble, your eustachian tubes - the tiny channels between your nasal passages and your middle ear - are likely to be blocked by the swollen membrane in your nose, which could cause discomfort during changes in cabin pressure, particularly during descent

- To "clear" your ears, try swallowing, chewing gum and/or yawning, all activate the muscle that opens your eustachian tubes.
- Nasal sprays, antihistamines and decongestants can be used prior to and during flight -- again, consult your physician for specific guidance
- Supplemental oxygen may be recommended for people suffering from existing medical conditions Consult your doctor about your condition for flying and your requirements for supplemental oxygen

If you have a pre-existing medical condition that warrants supplemental oxygen, it can be ordered from most airlines by calling the airline several days before the flight and requesting supplemental oxygen

Jet Lag

A familiar complaint related to traveling is what is commonly known as "jet lag", scientifically termed Circadian Rhythm Upset. "Jet lag" symptoms can range from swings of sleeplessness, extreme tiredness, appetite at odd hours or the loss of appetite altogether

This general feeling of fatigue is due in part by the body not having a chance to adjust to new night-day cycles which happens when one travels to different time zones As a rule, the more time zones one crosses during a flight, the more one's biological clock is disturbed Several ways to avoid or help diminish the effects of "jet lag"

- Get a good night's sleep the night before your flight
- On short trips of three to four days or less, leave your watch on your home time and try to eat and sleep accordingly If your stay is longer, try to prepare your body clock for the time zone at your destination in advance by gradually adjusting meal and rest times to correspond with those of your destination
- After arrival, if you cannot sleep, try some light exercises, go for a brisk walk, do some reading It generally takes the body's internal clock one day to adjust per time zone crossed

Motion Sickness

If you are susceptible to motion sickness, consider the following

- Request a seat over the wings which is also less affected by air turbulence
- Try to schedule your flights on larger size airplanes as they are generally less affected by air turbulence
- Request a window seat - when the weather is clear and the ground or horizon is visible, one is less susceptible to motion sickness
- Consult your doctor about medications for motion sickness

Eating

Prior to your flight, eat a light, well-balanced meal that is easily digested Foods low in salt, sugars and dairy products, and vegetables, fruits and breads are preferable, because these foods are much easier for the body to digest during periods of inactivity

When flying with a baby, feed the child during descent Sucking and swallowing will help the infant equalize pressure in his/her ears

Blood Circulation

When you sit upright in a stationary position for a long period of time the central blood vessels in your legs are compressed, which makes it more difficult for blood to circulate through your body and get back to the heart As a result, body fluids are shifted out of the bloodstream into surrounding tissues where they are not available to your body's circulation system This can result in swollen feet, muscle tension, backaches, or a feeling of excessive fatigue during or even after your flight It is also a major factor of dehydration during long flights

The key is to increase blood circulation Stretch your legs regularly and flex calve and leg muscles frequently (approximately every 20 minutes or so)

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ATA is pleased to be able to provide these travel tips to you and hopes that they will help you have a more pleasant trip

LUDWIG

To: The House Subcommittee on Aviation
From: Sue Ludwig

Written statement (draft) for airline air quality hearing May 18, 1994

Verbal statement is shortened version of same material

Thank you for the opportunity to address the committee on the subject of airline air quality. My name is Sue Ludwig and I am a flight attendant for a major airline. Like thousands of frequent fliers and flight crew members, I am sick and tired of feeling sick and tired after almost every flight. For years, I worked as a domestic flight attendant on older narrow-bodied aircraft where the ventilation was provided by 100% fresh air, and I had no respiratory problems. Five years ago, after my airline merged, I began flying primarily long haul international flights and transcontinental flights where up to 50% of the aircraft ventilation was provided by recycled air. My health took an immediate turn for the worse. I couldn't breathe and I couldn't think.

My colleagues insisted that feeling sick and tired all the time came with the territory of long haul flying, that it was "jet lag" at its worst. But how much should we accept or excuse with the term jet lag? Circadian rhythm changes cannot account for the apparent high rate of respiratory distress and illness that many long haul flyers experience now. After studying the subject of airline air quality, surveying hundreds of flight attendants about their health problems, and conducting some inflight air quality research of my own, I am convinced that most of the symptoms we attribute to jet lag, are primarily due to poor airline air quality instead.

Inflight and postflight symptoms of shortness of breath and tightness of chest, headaches, colds, flu, chronic bronchitis and pneumonia, lung and sinus infections, extreme fatigue, loss of concentration, short term memory loss, congestion, coughing, runny noses, sore throats, hoarseness, bloody noses, and an array of other respiratory illnesses are rampant among the flight attendant group. That all-encompassing, harmless sounding term jet lag should be changed to "jet sickness" – because that's how many frequent fliers feel after they fly these days. They feel sick.

I would like to draw your attention to two specific areas which contribute to the problem of jet sickness. One is the practice of many airlines decreasing the inflight ventilation rates on long haul, wide-bodied flights to save fuel and money. Another area of concern for airline air quality is the lack of ozone level monitoring for airline cabin air. On Boeing 747-200 type aircraft which I work most often to Asia, three independent environmental control units, or "pacs" (pressurization and air-conditioning systems) provide the pressurization, ventilation and air conditioning for the aircraft. The same is true for DC10's and L1011's. Two pacs must remain on to pressurize the aircraft, but one pac may be shut off to conserve fuel, a practice that many airlines are exploiting now to save money. Three pacs provide the maximum ventilation rate. When a pilot resorts to "two pac operation" instead of three, the fresh air ventilation rate is cut dramatically for passengers and crew. The negative effects of shutting off one pac in flight are probably not

felt in the cockpit, however, because the cockpit is provided with up to 150 cubic feet of fresh air per minute to help cool the avionics.

The ventilation rates in the passenger cabin are much lower. In first class, on a full Boeing 747-200, 40 cubic feet of fresh air per person per minute are provided with all three pacs on. This rate drops to 26 with two pacs. In coach, where the density of seating is greater, only 17 cubic feet of air is available to each passenger but drops to 8 with only two pacs. It is no wonder that some pilots are less than sympathetic to flight attendants who call them from the coach cabin to complain that the passengers or crew are feeling faint, dizzy, having headaches, or difficulty breathing. The pilots, who are sitting down in a smoke free environment with up to ten times the fresh air that is available in coach, do not identify with the air quality problems in the main cabin — they feel fine. Flight attendants, on the other hand, are walking around and working in these low ventilation rates, breathing in or trying to breathe in five times more of this questionable air because they're aerobically active. The cabin pressure altitude is usually greater than 5,000 ft. as well (some narrow-bodied aircraft types regularly reach cabin pressure altitudes of close to 9,000 feet!). There are a few pilots who do not take flight attendants cabin air quality complaints seriously and are reluctant to turn the third pac back on even when requested to do so. They rationalize that they are saving the company money and, in the case of financially strapped airlines, they feel that they may be saving their own jobs by conserving fuel at any cost. These same few pilots are quick to point out that the airline, the aircraft manufacturer, and the FAA all say that these low ventilation rates do not harm the passengers or crew. I disagree.

At these lower ventilation rates carbon dioxide levels from the exhalations of close to four hundred passengers are rising rapidly as are virus and bacteria levels. Contaminant levels build up as well. Carbon monoxide from cigarette smoke (smoking is still allowed on international flights), possible outgasing of chemicals from new upholstery and carpets, traces of insecticides and carpet cleaning solution may be present and who knows what kind of synergy these contaminants and others may produce reacting with each other.

The virus and bacteria levels are of particular concern to me. Each year a new strain of influenza is bred in Asia, making its way to North America putting many people at risk. Flights coming from Asia may be a major route of entry for these new viruses each year, and viruses are too small to be filtered out in the aircraft filtration system. All the more reason to use the highest ventilation rate possible on the aircraft. Moreover, tuberculosis is on the rise in this country, and TB bacteria are airborne. With more strains of tuberculosis becoming resistant to treatment, every precaution possible should be taken to protect the passengers and crew. Again this calls for using the highest ventilation rate possible in the shoulder to shoulder airline environment. It can be argued that no amount of increased ventilation can guarantee that a passenger will not contract TB from another contagious passenger. It can also be argued, however, that increased ventilation rates may decrease the chance of a passenger or crew member contracting this serious lung disease on board. Maximum ventilation rates should be used at all times, especially on long haul flights where the length of exposure to certain illnesses enhances the chances of contracting them.

The presence of airborne viruses and bacteria in aircraft air makes the levels of ozone found in cabin air an even greater concern. The respiratory system is more

susceptible to infection from viruses and bacteria after it has been exposed to ozone. Ozone in airline cabin air continues to be a serious threat to the respiratory health of passengers and crew, but its presence and danger have been understated. Through Harvard University, where I am a student and a degree candidate, I conducted my own onboard testing of ozone levels with the help of the Harvard School of Public Health. For a year, I monitored the levels of ozone on every flight I worked or rode on as a pass rider (including airlines other than my own).

I chose to monitor ozone levels because I felt that the respiratory symptoms associated with ozone exposure were prevalent among flight attendants flying long haul flights and were symptoms I myself was experiencing during and after flights. Symptoms of ozone exposure include tightness of chest and shortness of breath, headache, coughing, hoarseness, sore throat and nose bleed. Many of these symptoms, especially the shortness of breath, may be delayed six hours or more after exposure and then may persist for hours or days after exposure. Ozone or O_3, is triatomic oxygen — O_2 with an extra atom of oxygen and is present at the higher altitudes that airlines fly through. Although ozone is beneficial in that it shields us from ultraviolet rays, it is harmful to breathe. Ozone enters the plane through the engines along with the air that is used for ventilation. Ideally ozone is stopped before entering the cabin by passing through the catalytic converters which convert it back to O_2 or oxygen. One converter is down-line of each pac.

The problem arises when the catalytic converters don't work. They may become coated by flying through a patch of industrial pollution (or poisoned) which renders them ineffective. Currently there is <u>no</u> law which requires the airlines to check to make sure the converters are working properly. There is no maintenance regime required by the government or manufacturer, either. A new catalytic converter could be placed on an aircraft one day, become poisoned the very next day and perhaps not be replaced for six years which has been advertised as the life span for some converters.

I spoke with the retired Boeing engineer who invented the first catalytic converters for aircraft and who also designed the current generation converters that aircraft manufacturers use. I asked him, in the absence of inflight monitoring of ozone levels and/or required scheduled maintenance, how would one know if the converters were working or not? He informed me that the first indication that a catalytic converter was not removing ozone efficiently from cabin air would be "a sick flight attendant." Working flight attendants breathe more ozone than passengers and pilots sitting down. This is 1994; a flight attendant should not be a canary in the mine for harmful ozone levels in airliners.

In the past, the effects of ozone were thought to be transient. Researchers know better now. The health effects of ozone exposure are serious and may be long term. They include pulmonary edema, chronic bronchitis, premature aging of the lungs, permanent cellular damage to the lungs, diminished lung capacity, and as previously mentioned, greater susceptibility to viral and bacterial infection which may lead to lung disease. These long term health effects of ozone exposure have caused at least one researcher to view chronic ozone exposure as a potential source of new industrial disease.

The health effects of ozone are also cumulative. This has prompted prominent researchers to recommend that ozone limitations for workers to be measured by annual exposure levels as well as hourly exposure levels. For example, a flight attendant who has

been exposed to ozone levels which exceed the FAA limitation of 0.1 ppm may suffer acute symptoms of ozone exposure. Another flight attendant, however, who has chronic exposure to high levels of ozone that do not exceed the FAA limitation may still suffer more long term lung damage because of the cumulative effects of ozone exposure. Continuous inflight monitoring of ozone levels is needed to detect catalytic converters that are not working properly and to assist in calculating the annual cumulative levels of ozone that flight crews are exposed to. In 1986, the National Academy of Sciences recommended that the FAA monitor ozone levels in airline cabins for many of the reasons listed above, yet the FAA has failed to act in this area of air quality.

The preliminary results of my research project, which monitored inflight ozone levels for a year, shows the the FAA limitation of 0.1 ppm (TWA of 3 hrs.) was exceeded in 17 % (20 flights) of the 118 flights I monitored that were longer than three hours and above 27,000 ft. Moreover, the FAA limitations were exceeded for the entire length of many transcontinental flights when ozone levels and hours were averaged. In conjunction with the flights I monitored, I took testimonies of flight attendents who worked those flights, asking how they felt on those specific flights and others. These compelling testimonies in the crew member's own handwriting offers further evidence that respiratory distress was a factor for many crew members on the flights I monitored. Government agencies often complain that they do not have enough evidence in the form of firsthand testimonies or hard data to decide that a problem exists. My research project provides both from the very group that has been subjected to this unreasonable and even debilitating air quality for years now.

I urge this committee to take steps now to ensure that maximum ventilation is provided on all flights for the health and safety of passengers and crew and to help eliminate the serious problem of ozone in airline cabin air. The fact that it may take an act of congress to have enough air – enough ozone-free air to breathe on airlines should be an embarassment to the industries responsible and to the FAA for allowing this situation to progress so far, for so long. If this committee resolves to take action now, we can finally make a few steps in the direction of finding a cure for "jet sickness".

Thank you again for the opportunity to share my findings with the committee. I would also like to thank my fellow flight attendants as well as the scientists, researchers, doctors, professors, and concerned citizens who are hard at work on this urgent issue of airline air quality.

BEFORE THE SUBCOMMITTEE ON AVIATION
HOUSE PUBLIC WORKS AND TRANSPORTATION COMMITTEE

AIRLINE CABIN AIR QUALITY

May 18th, 1993

TESTIMONY OF

DEE MAKI
NATIONAL PRESIDENT
ASSOCIATION OF FLIGHT ATTENDANTS, AFL-CIO
1625 MASSACHUSETTS AVENUE, N.W.
WASHINGTON, D.C. 20036
202-328-5400

Mr. Chairman and Members of the Subcommittee:

Thank you for this opportunity to address the Subcommittee about the important issue of aircraft cabin air quality. My name is Dee Maki and I am the National President of the Association of Flight Attendants, AFL-CIO, which represents 33,000 flight attendants at 21 U.S. carriers. Accompanying me today is Chris Witkowski, AFA's Air Safety and Health Director. As you can imagine, since the aircraft is the working environment for flight attendants, cabin air quality is a matter of vital interest to the Association of Flight Attendants.

I am here today to discuss the quality of cabin air, its health impact on flight attendants and the failure of the federal government and carriers to address this situation. Currently, flight attendants and passengers on many flights are not provided adequate amounts of fresh air and, thus, may be exposed to unacceptable amounts of bacteria, viruses and other potential health risks -- without the protection of adequate federal regulations.

This occurs because less fresh air is being circulated in the cabins of newer airplanes which mix recirculated air with fresh air drawn from outside the aircraft. Most planes built prior to the early 1980s were designed to provide 100 percent fresh air that was replaced every three minutes. Today, newer airplanes offer an even mix of fresh air and recirculated air that is

exchanged much less frequently -- up to seven or more minutes. Cabin air exchange rates on a Boeing 747-300 with option low flow, for example, are as low as once every nine minutes during descent.

The National Academy of Sciences, in its 1986 report, The Airliner Cabin Environment, stated that about 30 percent of the hours flown by U.S. airlines in 1985 were on aircraft with recirculation systems. By 1990, the comparable figure had increased to 40 percent.

Additionally, because of variations in seating density, air circulation rates can vary widely within the cabin. Air flow may be two or three times greater in the first-class and business sections than in the economy section.

Another cause of ventilation reduction is the fact that flight crews on most aircraft can regulate the Environmental Control Units (ECU), or airpacks, that deliver fresh air. This "flow control" capacity is installed to allow crews to adjust airflow when the aircraft is carrying less than a full load of passengers. However, in this day of fuel conservation, airline carriers may encourage their flight crews to operate an ECU at a lower level than is appropriate. This "low flow" or "pack off" saves fuel and money. I have attached three documents from two carriers and one union that give examples of carriers urging

flight crews to decrease air flow to save fuel and money.

Unfortunately, reducing fresh air circulation can increase the amount of airborne toxins, viruses and bacteria in the cabin. If not properly ventilated, a tightly sealed airliner is the ideal environment for the spread of bacteria, viruses and fungi. As a result, flight attendants and passengers are exposed to one another's respiratory ailments as well as high levels of carbon dioxide and other gases including vapors and fumes from materials and chemicals inside the aircraft.

In addition to the problems caused by reducing the ECU, other problems can be attributed to the high efficiency particulate air filters, or HEPA filters, used on aircraft. While the airlines stress that HEPA filters remove airborne particles before air is recirculated in the aircraft cabin, the filters can become blocked. These filters can remove a high percentage of airborne particles, including bacteria and viruses that collect in clumps. But they are ineffective against single viruses. These viruses pass through the HEPA filter and then circulate throughout the cabin. Eventually, the filters do get clogged by airborne particles and become ineffective if not changed often enough.

I would like to take a moment to comment on the Air Transport Association's recent study regarding air quality on aircraft. AFA has many questions concerning how this study was conducted in

terms of the methodology of collection and the frequency of collection of samples, especially bacterial samples. The scientific methodology greatly impacts the amount of microbial aerosols captured. In its report, ATA stated that the two "fresh air" airplanes showed significantly lower average levels of contaminants than the aircraft with recirculated air. This indicates to us that the HEPA filters used on new aircraft were not as effective in removing bacteria as expected.

Another concern we have with the ATA study is their data on respirable particulates. Their data indicates that the average amount of respirable particulates was 170.1 micrograms per meter cubed. Only nonsmoking flights were tested. In the 1989 DOT sponsored GEOMET study, a comparable amount of respirable particulates were found on smoking flights only, but a much lower amount was found on nonsmoking flights. This raises questions about the measurements of this level of particulates in the ATA study. Furthermore, we are baffled by the discrepancy within the study which on one hand lists "staphylococcus aureus," a potential pathogen, as one of the bacterial organisms isolated from samples but also states that "no bacterial or fungal respiratory pathogens were isolated during this study."

Research has found that flight attendants and airline passengers as a population may be particularly susceptible to infection. In a paper presented at the 1991 Paris Air Show, Dr. Helen Ashworth,

technical manager at Pall Biomedical, a leading filter manufacturer, reported that viruses survive well in the low humidity conditions common aboard aircraft. She believes that passengers may be more susceptible to infection because they are "stressed, tired and their respiratory system is compromised due to low humidity," all factors shared by flight attendants.

For a variety of reasons, it is difficult to determine how current airline practices contribute to the spread of infectious diseases. For one thing, the government does not monitor or track the frequency or seriousness of crew and passenger complaints regarding cabin air quality. For another, few complaints are recorded since flight attendants and passengers may never realize that they are contracting or spreading an infection when they fly.

In addition, while most people normally would not fly when seriously ill, they may well fly during the incubation period before symptoms of an illness become evident. And this period of latency happens to be the period when infections are most likely to be transmitted.

Because flight attendants and airline passengers generally scatter upon reaching their destination, it is difficult to spot any trend of post-flight illness that may develop. Infectious diseases may have an incubation period of several days, so flight

attendants and passengers may not connect an after-the-trip illness to recent airline travel.

There are at least two examples of illnesses linked to poor cabin air quality on record. In 1979, nearly three-fourths of the 54 people aboard a flight bound for Kodiak, Alaska, became ill after the plane was delayed on the ground for three hours while the ventilation system was not functioning. The problem was discovered only because many of the passengers visited the same doctor when they reached this remote destination. It may well be that many comparable situations have gone undetected when flight attendants and passengers dispersed upon arrival in more populated areas.

In a second case in 1986, dozens of people on a flight from Chicago to Hawaii complained of headaches and nausea. The National Transportation Safety Board reported that the flight crew's second officer experienced similar symptoms after he visited the cabin, and he "said that once he personally experienced the headache, he rejected the notion that the flight attendants were just complaining..." Investigators later determined that one of the aircraft's recirculating fans had been inoperative and that filters on the other two were clogged.

Recently, the Centers for Disease Control and Prevention (CDC) investigated transmission of tuberculosis (TB) in the case of two

flight attendants who were diagnosed as having tuberculosis after flying with another crew member with active TB. In October of last year, CDC concluded that TB "was transmitted from an infectious flight attendant to crew on the aircraft." Additionally, researchers tested a number of passengers who flew with the infected flight attendant during this time. The passengers who tested positive on tubercular skin tests all flew when the flight attendant was most infectious. The study concluded that passengers could have been infected with tuberculosis in flight.

It is unreasonable to expect that an airline, or its crew, will be able to know, on any given flight, whether or not there are passengers in the cabin with infectious TB, influenza, chicken pox, colds, etc. In addition, it is difficult to know which passengers are too ill to fly and should be removed from the flight. Because of these unknowns on any given flight, it is imperative that all the airpacks be operating and the fresh air flow be set on maximal flow.

AFA has received many anecdotal complaints from its members about poor cabin air quality and related respiratory problems and other health difficulties. One AFA safety and health representative reported that some flight attendants have felt so sickened from cabin air that they could not work their next scheduled flights. AFA has reports of flight attendants who have suffered severe

headaches, disoriented feelings, dizziness, severe chest pains, stomach cramps and numbness of limbs to name a few symptoms. We have had flight attendants who have been too sick to carry out their safety responsibilities and have used oxygen onboard aircraft to relieve their symptoms. Most of these members have dealt with flight crew and managements who have been unconcerned, uncooperative and unhelpful in assisting them to determine the exact source of their symptoms.

The Association of Flight Attendants is concerned that despite years of talk about aircraft air quality, there has been little action. A 1981 article distributed by the Washington Post news service told readers that "Fresh air in airplane cabins has been a subject of perennial complaint." Here we are thirteen years later and it is still a subject of great debate and not much action as far as the government is concerned. The government has not actively sought to compile data on health problems associated with cabin air quality, let alone set adequate regulations.

Federal regulations state only that "each passenger and crew compartment must be ventilated" and that compartment air "must be free from harmful or hazardous concentrations of gases or vapors." [14 CFR 25.831(a)&(b)] But there are no explicit requirements for ventilation rates for passenger cabins. The regulations spell out specific limits only for concentrations of

carbon monoxide (50 ppm), carbon dioxide (30,000 ppm) and ozone. I would like to note that on May 2nd, the FAA released a Notice of Proposed Rulemaking (NPRM) which lowers the limit for carbon dioxide in aircraft. AFA is pleased that the FAA has finally acknowledged the current high levels of carbon dioxide in aircraft but continues to believe the lower limit recommended is not low enough.

Additionally, there are no FAA rules concerning maximal airflow. The National Academy of Sciences, in its 1986 report, found wide variations in aircraft ventilation rates, with some flight attendants and passengers receiving well below 10 cubic feet per minute per person of fresh air. The report recommended that "maximal airflow be used with full passenger complements to decrease the potential for microbial exposure and that recirculated air be filtered to reduce microbial aerosol concentrations."

In 1989, the FAA did issue a NPRM that would set limited air flow standards for aircraft yet to be certificated, but it falls far short of the standards needed to assure adequate fresh air for flight attendants and passengers. After five years, this limited proposed standard has yet to be acted on.

Before I conclude my remarks, I would like to make a few comments on the issue of pesticide spraying on international flights.

Pesticide spraying required by some governments is subjecting many AFA members to inhalation and skin absorption of pesticides on a regular basis. The label on one insecticide being used on aircraft, which contains d-phenothrin, warns that the product is hazardous to humans if swallowed, breathed or absorbed through the skin. However, while spraying this insecticide, flight attendants, as well as passengers who are onboard, inhale the dangerous vapors. In addition, since the spray drips down their arms during spraying, some pesticide is absorbed directly into flight attendants' skin. We are encouraged by Transportation Secretary Federico Pena's recent interest in this issue and are hopeful that the U.S. government will move forward to protect flight attendants from this dangerous pesticide spraying.

To conclude my remarks, let me say that AFA is very concerned about the serious health implications of poor cabin air quality facing flight attendants today. We strongly believe that we need solid air quality standards for the aircraft cabin. It is time we protect the health of flight attendants and passengers through Congressional action if the FAA continues to fail to regulate in this area. In addition, AFA believes there should be a national reporting system so crew members and passengers can report problems that may be associated with air travel and cabin air quality to determine if there are trends or clusters of illnesses occurring.

Enough is known to warrant the establishment of ventilation standards for the closed environment of the aircraft cabin, just as is the norm for public buildings and other facilities. Carriers should make it standard practice to run their air packs at full capacity even when carrying reduced loads, since reducing total flow usually results in poor circulation patterns in the cabin. Running the airpack to full capacity will help to increase the amount of fresh air per cubic foot for each cabin occupant. Certainly, flight attendants and passengers should be able to count on some minimum level of fresh air to counter the dangers of infection and illness when they fly.

Mr. Chairman, thank you for this opportunity to address this Subcommittee. I will be happy to answer any questions you may have.

Attachment 1

To:

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FOLLOWING MANY DISCUSSIONS ON THIS ISSUE, AS WELL AS F/A INJURY REPORTS AND PASSENGER INCIDENTS, WE HAVE FINALLY BEEN ABLE TO MAKE A RECOMMENDATION THAT WAS ACCEPTED. AS YOU KNOW THE AIR FLOW SETTING FOR CABIN AIR FLOW WAS ON LOW FOR PAX LOADS OF 100 OR LESS. AT 100 PAX OR MORE THE SETTING WAS NORMAL. HI SETTING WAS USED IN VERY HOT OR VERY HUMID SITUATIONS. ALL THAT TO SAY THAT NOW THE SETTING WILL BE ON NORMAL AT 85 PAX OR MORE THIS REPRESENTS AN ADDITIONAL ANNUAL COST OF $ 75,000 MAINLY DUE TO HIGHER FUEL COSTS. THE FUEL COST DIFFERNTIAL BETWEEN LOW AND NORMAL IS $ 5.00 AN HOUR I WANT TO THANK ALL OF YOU FOR YOUR PERSISTENCE IN GATHERING DATA AND LOOKING FOR ALTERNATE SOLUTIONS IN THIS PRESSING ISSUE. ANOTHER BREATH OF FRESH AIR !!!

E TURBULENCE PENETRATION (Cont'd)

5 Use of the autopilot turbulence penetration mode is recommended for auto-pilot operation in severe turbulence. In this mode the attitude and rate gains are reduced. (Additionally, the yaw damper operating with the autopilot TURB mode will aid in minimizing structural loads.)

F PACK OPERATION

Although two pack operation is encouraged whenever possible, in order to improve air quality and temperature control:

1 All three air conditioning packs are to be operated continuously when the passenger load exceeds three hundred (300). *

2 The third pack will be utilized, regardless of load, on the first report of passenger discomfort from the In-Charge flight attendant.

G CABIN LOG BOOK

Prior to the PRE-DESCENT CHECK, the Second Officer will determine if the cabin log book contains any operational items and if required, will follow the procedures in 02.90.

Attachment 3

FROM COCKPIT, UNITED AIRLINES, SEPTEMBER 1993, VOL.8, NO. 3

CONFIGURATION MANAGEMENT

by Captain Lew Kosich

In times when every last penny is significant, it is well to review an operation from every perspective. Much has been said about "saving fuel." Let's examine that old saw from a slightly different perspective — Configuration Management. "Configuration" will be expanded from the normal context of "Where are the gear and flaps?" to include other things regarding airplane operation. The review will follow a phase-of-flight format and include some things that are obvious to the point that they are almost not worth mentioning, and perhaps a few that will be new and thought provoking. Most will involve things over which the crew has control, but some will be included for information or to indicate the need for a maintenance write-up.

Preflight

Be on the lookout for drag-increasing items such as missing or protruding flap seals, miss-fit doors, protruding spoiler panels, etc.

Start/Push back/Taxi

Some engines have tailwind limits for starting. All engines experience higher EGT peaks when started in tailwind conditions, and lower when started in headwind conditions. Higher start EGT contributes significantly to engine turbine deterioration, which, in turn, contributes to increased specific fuel consumption. Consider using pushback to optimize relative wind for engine start when the opportunity exists.

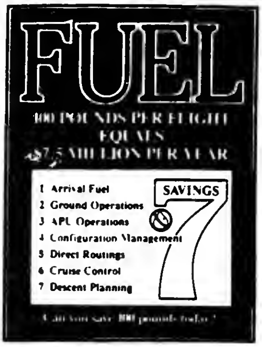
In general, waiting for maximum motoring rpm before bringing the fuel on at start minimizes peak starting EGT.

APUs burn about six times as much fuel as ground power/air conditioning units. (For 747s it's about twice that.) Leave the APU off as long as possible, considering required stabilization time, until needed for engine start. The 10-minute departure check is a useful tool.

When the opportunity exists, consider taxi with an engine shut down. (See Landing.)

Takeoff

A rolling takeoff is usually more efficient than a static takeoff. This is because, considering line-up distance, the takeoffs begin at approximately the same point. In the case of the rolling takeoff, final takeoff thrust being set slightly farther down the runway is offset by being in motion at the beginning of the takeoff



run. Aside from not having to overcome the inertia of the airplane at rest, the rolling takeoff is easier on the engines because of improved inlet flow, and the absence of vortices from the runway to the lower lip of the inlet, which exist when thrust is set with the airplane stopped or at very low speed.

Reduced Thrust can actually take a few drops more fuel to make a given takeoff. But, because reduced thrust allows operation at lower levels of temperature, pressure and engine rotor speed, the few drops are more than regained in terms of the payback in reduced engine operating cost and engine component failure rate.

Departure/Climb

Climb opposite to the direction of intended flight at reduced speed, as close to best angle of climb speed as possible, i.e., maximize altitude for distance, while traveling the minimum distance in the wrong direction. Climb in the direction of intended flight at high speed, or best rate of climb speed, to optimize altitude for time and distance during climb.

Retract flaps in accordance with the speeds depicted for flap retraction on the Flip Cards. Those speeds optimize acceleration by minimizing drag while providing stall protection.

Climb at maximum climb thrust unless procedurally restricted from doing so. Reducing climb thrust, because of the lower thrust levels, provides little of the benefit of reduced takeoff thrust and reduces climb rate. Minimum time to cruise altitude [illegible] efficiency.

Cruise

Remember primary flight training: "[illegible] trim!" For example, if each airplane in our DC-10 fleet were to experience a 1% drag increase, it would result in about a $2 million increase in the annual fuel bill. For a more visual example, if a spoiler on one airplane was deflected 1 inch and balanced by the auto pilot (or manually), the cost in increased fuel used in a year would be about $35,000 for that airplane. This is approximately the effect of one degree of lateral mistrim. Consider the inverse and always keep the airplane in trim. Review the T&R trim techniques section. Also, an inflight inspection of the control surfaces of an airplane that is difficult to trim could be input on a maintenance write-up.

Cruise altitude selection is a subject that merits a detailed discussion of its own. For the purposes of this discussion, optimum altitude from the cruise charts should be selected for schedule planned Mach for existing airplane weight and ambient conditions, i.e., consider wind trade. Step climb should be made when the chart shows the specific range (NAM + 1000) at the next available altitude equal to the present altitude. If flight is to be constrained to one altitude for a prolonged period, it is generally better to select a higher altitude, somewhat above optimum for initial conditions, and initially fly at a lower speed then to be stuck for a long period at below optimum altitude.

A Mach indication error which results in a reading .01 low in the Mach .80 range, i.e., Mach indicates .80 but actual Mach is .81, can result in as much as a 1.5% increase in trip burn. As a general rule, if there is a discrepancy between Mach indicators, fly the higher and report the error.

While pressurization leaks (leaky door seals and other pneumatic system related problems) are maintenance concerns, they can have a significant impact on fuel burn. Timely maintenance action can result in fuel savings.

Proper level off/thrust setting [illegible] have a very positive effect in minimizing [illegible] burn. As a general rule, accelerate [illegible] Mach while maintaining climb [illegible] target cruise thrust (non autothrottle [illegible]). Monitor Mach very closely until [illegible] cruise speed is established. [illegible] to let speed drop below target cruise [illegible]

Regaining target speed requires considerable excess thrust to overcome the drag from the higher angle of attack at the lower speed.

Monitor the capacity of the autothrottle to maintain constant Mach. A system that is constantly chasing Mach is extremely inefficient. The cause could be internal (from a system problem) or external (for example, from mountain wave effect). In either case, manual cruise control would be more efficient.

*

On some airplanes, operation with a pack shutdown can reduce fuel burn. Evaluate such items as load factor, smoking or non-smoking flight, and other ventilation requirements.

Descent

"The most important factor in reduction of descent fuel burn is the use of idle thrust at fixed speed (250 kts)," according to a Douglas Special Supplement on Fuel Conservation published in 1978. This profile is often inhibited by ATC considerations; however, it can consume as much as 50% less fuel than a high speed fixed descent rate profile.

Holding

Holding should be done at the highest altitude and cleanest configuration possible.

Terminal Area Maneuvering

The cleanest possible configuration is generally the most efficient. ("Stay as clean as possible for as long as possible.") Maneuvering speeds on the Flip Cards provide minimum speeds for maneuvering at the specified flap setting. The most fuel efficient speed for a given configuration is generally 10-15 kts. greater than the minimum maneuvering speed.

Landing

Landing at a lower rather than the highest certified landing flap configuration is more fuel efficient. (Obviously there are many considerations other than fuel efficiency governing landing flap selection.)

A study conducted by a European Airline Consortium's engineering department a number of years ago indicated that minimum use of reverse thrust on a dry runway [illegible] slightly greater than idle [illegible] returning to forward idle by 80 kts. The study considered fuel consumption, engine wear, brake wear and tire wear.

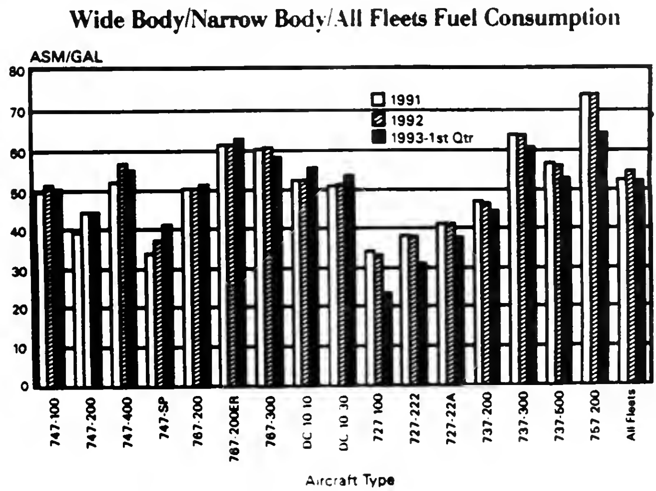
Back taxi

A Douglas study on DC 10-30s showed that for an average six minute taxi, shutting down one engine three minutes after landing saved 16,000 gallons of fuel/airplane/year. (Based on a utilization of 3,600 hrs/yr with an average segment length of three hours.)

As I said up front, some of the factors mentioned here have more effect on fuel consumption than others, and some are more easily controlled by pilots than others. Nevertheless, a little thought about our configuration during each phase of flight will give us lots of opportunities to save 100 lbs. of fuel (or more) on each leg.

FEEDBACK ON FUEL

How are we doing on fuel conservation? Here is some historical data by fleet using a measurement (ASMs per gallon of fuel burned) that is somewhat less subject to price fluctuations and seasonal load changes than other measurements. What's the trend for your fleet? Any ideas why the rate is going the direction it's going? We'll get back to this performance indicator from time to time in the future.



AIRLINER CABIN AIR QUALITY

STATEMENT OF THE
INDEPENDENT FEDERATION OF FLIGHT ATTENDANTS

AND THE
INTERNATIONAL BROTHERHOOD OF TEAMSTERS, AIRLINE DIVISION

TO THE
U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION
SUBCOMMITTEE ON AVIATION

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NEW YORK, NEW YORK 10017
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MAY 18, 1994

Mr. Chairman and Members of the Subcommittee;

Thank you for the opportunity to speak with you today concerning airliner cabin air quality. My name is Mary Ellen Miller, Director of Safety and Health for the Independent Federation of Flight Attendants, representing the flight attendants of Trans World Airline. With me today is Nancy Garcia, Health and Safety Representative for the Teamsters Airline Division (IBT). IBT represents the flight attendants at Northwest airline and World Airways.

Although we do appreciate the opportunity to appear before this committee to discuss flight attendant concerns about cabin air quality, we are aware that this is not the first time we have had to bring this and other concerns before Congress. To prepare this testimony we were reminded that this is just one of many issues which have been brought before you because of flight attendant concerns that have not been adequately addressed by the Federal Aviation Administration (FAA).

During 1983 and again in 1984, flight attendant unions testified before Congress on the very issue under review today. As a result of those hearings, Congress, in Public Law 98-466 mandated that the National Academy of Sciences conduct a study to determine whether air quality and standards aboard commercial aircraft are adequate for health and safety of all who fly. The Academy was asked to determine whether such aspects of cabin air as the quantity of outside air, the quality of on board air, the extent of pressurization, the characteristics of humidification, the presence of cosmic radiation, contaminants (such as bacteria, fungi, and other microorganisms), and pollutants (such as environmental tobacco smoke, carbon monoxide, carbon dioxide, and ozone) could be responsible for health problems in the long or short run; to recommend remedies for problems discovered; and to outline the safety precautions necessary to protect passengers in the event of in-flight fires, which produce smoke and fumes.

The Academy published it's findings in 1986. In their report 'The Airliner Cabin Environment' they made eight recommendations to improve cabin air. The FAA has <u>not acted on one of them.</u> Only one recommendation has been implemented — the domestic smoking ban — and that was by congressional legislative action.

In 1989, three years after the NAS report, the FAA issued a proposed rule that would set limited air flow standards for newly certificated aircraft. The proposed rule is still that — a proposal. Recently, the FAA has responded to another 1986 NAS recommendation and has announced that it is preparing to lower the Federal Air Regulation (FAR) 25.831 limit on Carbon Dioxide (CO_2) from 3% to .5%. The American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE) recommended limit is .1%. While this is a significant reduction from the current outdated

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standard, .5% is still five times the ASHRAE recommended limit of .1%. Again, this is , as yet, a proposed action and not an accomplished deed.

So where are we today? What progress has been made eleven years after the first congressional hearing on cabin air quality and eight years after the NAS report? Let us do a quick review. The NAS report stated:

> "Empirical evidence is lacking in quality and quantity for a scientific evaluation of the quality of airliner cabin air or of the probable health effects of short or long exposure to it. Standards directly applicable to commercial aircraft have not been established for cabin ventilation rates, environmental conditions, and air contaminants, and adequate data on these factors are not available. The Committee therefore recommends that FAA establish a program for the systematic measurement, by unbiased independent groups, of the concentrations of carbon monoxide, respirable suspended particles, microbial aerosols, and ozone and the measurement of actual ventilation rates, cabin pressures, and cosmic radiation on a representative sample of routine commercial flights. These findings should be subjected to peer review. This would provide a basis for establishing appropriate standards if justified and or requiring regular monitoring if necessary.
>
> The committee recognized the extreme difficulty of interpreting data on the health effects of air travel, but believes that several kinds of data can be collected. The Committee recommends that FAA establish a program to monitor selected health effects on airliner crews."

Further, the NAS study could see the handwriting on the wall. They said:

> "It is highly probable that eye, nose, and throat irritation will increase among airline passengers as outside-air ventilation rates are decreased and recirculation is increased to improve fuel efficiency."

Neither of the NAS recommended programs was ever implemented in spite of the fact that new generation aircraft utilizing recirculation systems were already taking to the skies in the early and mid eighties.

Even before the new generation aircraft ventilation systems flight attendants were reporting respiratory illnesses related to cabin air quality. In fact, California Department of Industrial Relations workers compensation data concerning work injuries and illnesses reported by flight attendants during 1979 showed flight attendants had twenty times the expected frequency of respiratory illnesses compared with other workers.

Despite the NAS report, flight attendants and passengers complaints and documented flight attendants illnesses, the FAA continues to ignore the cabin air quality issue. Industry has not done much better. Just a few weeks ago the Air Transport Association (ATA) made public the result of their cabin air quality "study" which concluded that cabin air quality is just fine. But a limited survey of a few short range non-smoking flight segments is not what NAS had in mind, nor do we believe it is appropriate to draw

conclusions about cabin air quality from such limited data. In short, flight attendants continue to be concerned about cabin air quality and, if anything, our concerns have increased.

The Move to Less Ventilation

According to a report by Paul Halfpenny, formerly with Lockheed aircraft, when fuel costs shot up drastically in 1979 and 1980, the airlines began looking for ways to cut direct operating costs. A number of studies were made by McDonnell-Douglas in conjunction with NASA and one major airline to see if acceptable cabin conditions could be maintained with reduced bleed air and filtered recirculated air. The tests concluded that bleed air on the DC-10 aircraft could be reduced by about 50%, and replaced with recirculated air treated through filters. Now all new aircraft have incorporated recirculation systems.

Air for recirculation may be taken from below the floor as in the MD-80 series, from overhead as in the A-300 and DC-10, or from both sources as in the B-747. Air may be recirculated throughout the cabin providing total mixing of all air as in the MD-80, B-737, B-757 or B-767 or it may be recirculated only back into its own source zone, as in the DC-10 and A-300. The B-747 has systems that take recirculation air into a general mixing manifold for distribution throughout the cabin, and supplement it with air taken from each zone and returned to that zone.

All aircraft use filters in their recirculation systems. These filters are capable of removing particulates down to 0.3 micrometers with efficiency greater than 95%. These filters do not remove any gaseous contaminants such as CO_2, CO, body odors or the gaseous products of cigarette smoke. Charcoal filters can be used to remove many gaseous contaminants, however they are not effective for CO_2 or CO.

It is important that the recirculated air and the fresh air be properly mixed before it is distributed to the cabin. If this does not happen due to poor design or mechanical failure, too much recirculated air and not enough fresh air will be supplied to certain areas. These areas will feel "stuffy" or "stale" as CO_2 builds up.

Reduced ventilation can also occur through flight crew selection of a reduced pack operation. Reducing packs is not a violation of any FAA standard. In fact, the MEL's (Minimum Equipment Lists) allow for an aircraft to fly with one pack inoperative as well as with all fans inoperative. The shutting down of packs is not unique to one airline in the industry, in fact it is a wide-spread practice due to the fuel savings generated by the reduction.

For example, you can see from the bulletin issued by one of the major airlines shutting down packs that when flying a 747, turning off one pack is standard operating procedure after the aircraft reaches cruise altitude. Further, the bulletin states that pilots are directed to "use gasper and cabin recirculation fans as necessary for passenger comfort." This suggests that gaspers and fans are routinely shut down. When you

operate with a pack shut down <u>and</u> you shut off cabin recirculation fans, you have compounded the air quality problem. In fact, Boeing acknowledged this problem in a 1993 article for Airliner Magazine. The article by Daniel Space, Boeing Senior Engineer of Environmental Control Systems 747/767 Division states that:

> "Whether on the ground or in flight, Boeing does not recommend shutting off the airplane ventilation system when passengers are on board: an exception to this is for no Pack takeoffs in which the air distribution Packs are shutoff for a short duration on takeoff only, <u>but not the recirculation fans.</u>" (***emphasis added***)

Boeing has also issued a Service Letter in August 1993 to all Boeing customers, the ATA, and IATA. In the Service Letter they state the purpose is to advise operators of Boeing's design requirements, objectives and criteria for cabin air quality. They further state that the information should be made available to flight and cabin crews as well as engineering personnel. The five page document, which to our knowledge was not distributed to cabin crew, emphasized the need to keep all fans operating including available overhead and underfloor, supplemental and recirculating fans. They also asked airlines to operate the air conditioning and pressurization systems in accordance with published procedures, to operate air conditioning packs (or supply equivalent conditioned air) any time passengers are on board, and to maintain recirculation filters according to established maintenance intervals.

Boeing also concluded that the well-known event reported in 1977 where several airplane passengers became ill after a flight in which they had remained on board the airplane while the ventilation system was not operating, would probably not have happened had the system been operating.

The Boeing Service Letter also touches upon another interesting component in the cabin air quality controversy. In this document Boeing states that ventilation systems on Boeing airplanes currently in production provide approximately 50% fresh air and 50% recirculated air to the passenger cabin. This results in twenty to thirty total air changes per hour for the passenger cabin and as many as eighty total air changes per hour for the flight deck. The flight deck is provided a larger quantity of air per person for equipment cooling purposes and to minimize temperature gradients which result from solar heat loads and heat loss through the airplane skin and windows.

This difference between flight deck and cabin environments often creates another problem. If you will refer back to the airline bulletin on pack operating procedures, you will see that it directs flight deck crews to "be alert and responsive to advisories from the cabin. <u>On limited occasions</u> (***emphasis added***), short intervals of 3-pack operation may be required to increase circulation." This procedure sets up a potential conflict between the flight deck and the cabin. It makes cabin air quality on any given flight dependent upon subjective criteria.

Many years ago coal miners carried canaries down into the mines to test air quality. The flight attendant should not have to be the "canary" that detects an air quality problem aboard a modern airliner. A flight attendant should not have to assess air quality

and make a case to the flight deck to correct a problem. It is unfair to place the flight attendants in that position and, frankly, it is also unfair to the captain. Determining air quality standards, monitoring the cabin environment and setting policy and procedures are more properly jobs for the FAA.

Now, what about the fuel savings? The $2 million in the bulletin is based on an expected fuel savings of 1.5%, figure which may be optimistic considering data including some by McDonnell Douglas puts the savings closer to 0.8%. According to Healthy Buildings International, an air quality research firm, a closer examination shows the savings from reduced ventilation to be shortsighted. For example, consider the following scenario aboard a 747 aircraft, which typically recycles air: Increasing ventilation from say, 10 cubic feet per minute (cfm) to a minimum recommended rate of 20 cfm per passenger on a five-hour flight aboard a full 747 would result in a total cost increase of $240, or approximately 60 cents per passenger. (HBI calculated these figures when fuel prices were higher than today).

The aircraft cabin, in-flight, constitutes a total life-support system and cannot be, as reasonably compared to a bus, train, or to a restaurant or theater full of patrons. If oxygen-insufficiency should develop in any of these on-ground structures, the normal opening and closing of doors and the normal leakage of air through the structure itself will help to make up the deficiency. Air is known to even leak through brick, as a building "breathes".

At altitude, the positive-pressure status of the cabin, relative to the outside atmosphere, precludes the possibility for any leakage of air <u>into</u> the cabin. Rather, the air leaks which occur, all occur outward, <u>necessitating an even greater uptake of air through the existing ventilation systems.</u> Shutting down one third of the cabin ventilation system, may effect a net savings, annually, of some appreciable amount. But, at what cost to passengers and flight attendants?

The Cabin Environment

Just as in "sick buildings", the lack of adequate ventilation in aircraft reduces indoor air quality by permitting pollutants to accumulate. Some of these pollutants and some of their sources include carbon dioxide, produced by human breathing and dry ice in airplane galleys; atmospheric ozone, fibers and dust; nitrogen oxides; volatile organic compounds from fuel, cleaning fluids and other sources, nicotine from tobacco smoke; and bacteria, fungi and viruses.

Carbon Dioxide

NAS found carbon dioxide levels on aircraft in excess of limits recommended by ASHRAE and NIOSH; studies on Lufthansa showed levels more than twice the standard when operating air packs at 50% capacity.

The GEOMET study also found flights frequently were above the 1000 ppm level recommended by ASHRAE and GEOMET suggested that additional measurements of CO2 be done on different types of aircraft and with different levels of passenger occupancy. They also noted as a disadvantage the fact that their testing did not consider the different breathing height level of flight attendants, and the time flight attendants spend in the galleys of the aircraft.

As previously mentioned, the FAA is preparing to lower the current FAA regulatory limit of 3% for CO2 exposure to the OSHA limit of .5%, rather than the ASHRAE recommendation of .1%. The OSHA limit is a worker limit. The ASHRAE number is for public exposure. In the cabin of an aircraft, it is impossible to separate the workplace from the public place, consequently, passengers and flight attendants alike will be subject to a workplace limit. We believe that the more stringent standard is more appropriate.

Ozone

Eleven percent of the flights in the NAS report violated FAA standards for ozone levels, with some levels more than eight times higher than recommended. This is cause for concern, especially when you consider that exposure to ozone, even at levels below the maximum limits, can cause eye, nose and throat irritation, as well as asthmatic symptoms. Cabin ozone limits are set by FAR 121.578 and FAR 25.832. The use of catalytic ozone converters is generally required on airplanes flying where the cabin ozone levels can be predicted to exceed these FAR limits. The actual cabin ozone concentration depends on the design of the air distribution system and how it is operated and maintained and whether or not catalytic ozone converters are installed.

Flight Attendants are more exposed than passengers to the effects of ozone because they are more active and therefore have a higher respiratory rate. In addition, they breathe less humid air than seated passengers and this may increase the effects of ozone.

NAS could find no documentation of the effectiveness of the various methods being used by the airlines to control ozone. Therefore, the Committee suggested that FAA carry out a carefully designed program to ensure that cabin ozone concentrations comply with Department of Transportation regulations. The FAA has not instituted any program to monitor actual in-flight ozone exposures and the efficiency of current control measures.

Toxic Exposure

There are occasionally examples of what appears to be an atypical kind of extreme exposure. I would like to tell you about one such case. This incident occurred on June 12, 1990 at one of the major carriers and involved a 727 aircraft traveling from Columbus, Ohio to New York's LaGuardia airport. It had a flight attendant crew of four, and a total of twenty-two passengers. Many began experiencing health problems shortly after departing Columbus. By the time the flight arrived in New York, it was necessary that

paramedics and five ambulances meet the flight, as one-fourth of the passengers and one flight attendant were sick, and two other flight attendants were unconscious. Little is still known about the possible exposures that may have caused this reaction as the FAA admitted that it was not equipped to do on-board testing and was unsure if the airline or anyone else had done so. The FAA apparently made no request of any agency such as OSHA, which is equipped to do on-board testing, to provide assistance.

Humidity and Ventilation

Although it is a widely held belief now that increased ventilation to the cockpit was solely for the reason of meeting avionic and electronic equipment cooling loads, rather than ventilation, there is some evidence that there were other concerns. In a 1952 survey conducted by the A-9 committee of SAE, flight crews complained about the discomfort of the dry cabin air, the increased incidence of colds, and debilitating effects of smoke and odors resulting from recirculation of cabin air into the flight station. As a result of these objections and other developments, regulations have been established that require that the flight stations be supplied with 100% fresh air through an independent temperature control system.

Ventilation rate is expressed in volume of air per passenger. This value will vary greatly with a load factor. Within the average rate calculated for an aircraft, there will also be variations in different sections if multi-class seating density, is in operation. Aircraft are often altered by the addition of more seating, although no changes are made to the ventilation systems to accommodate additional passengers. The density of passengers aboard a tightly sealed airliner, combined with inadequate ventilation can make an airplane almost ideal for the spread of fungi, bacteria and viruses. Although most bacteria should be captured by a good filter, viruses are not captured as easily - furthermore, viruses prefer dry environments, like an aircraft.

The NAS study recommended that maximal airflow be used with full passenger complements to decrease the potential for microbial exposure and that recirculated air be filtered (to remove particles larger than 2-3cm) to reduce microbial aerosol concentrations.

Environmental Tobacco Smoke

ETS is now widely accepted as a health hazard to non-smokers. NAS found that it was apparent aircraft ventilation would not meet accepted criteria for acceptability.

The committee also felt that this potential threat to the health of nonsmoking passengers and flight attendants should not be ignored, especially because flight attendants on some airlines can fly up to the twenty-eighth week of pregnancy.

Recently, Alan Hinman, Director of CDC's National Center for Prevention Services told Indoor Air Review that ETS is a serious indoor air quality problem in planes. The ETS problem on all flights needs to be addressed.

Pesticides

The use of pesticide into passenger cabins and cargo holds on international flights coming into the United States was discontinued in 1979 after it was determined that the dangers to health out-weighed any benefits. However, for the past 15 years, the practice of releasing pesticides on international flights into 27 countries continues. International flights, on descent into, or on arrival at Antigua, Argentina, Australia, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Grenada, Guam, Guatemala, Honduras, Jamaica, Mexico, New Zealand, Nicaragua, Northern Marianas Islands, Panama, Peru, St. Lucia, Saint Maarten, Trinidad, and Venezuela, have their passenger cabins and cargo holds sprayed with pesticide by flight attendants as required by regulations of the local governments. Airline reservation agents are usually unaware of pesticide spray and rarely have information about the affected flights.

The spray often is Airosol Aircraft Insecticide, which has d-phenothrin as its active ingredient. D-Phenothrin is one of a class of pesticides called pyrethrins, which is non-persistent in the environment while being acutely toxic to insects. The spray is registered with the Environmental Protection Agency and sold under the trade name Black Knight Roach Killer. The release of pesticide into passenger cabins and cargo holds is approved by the World Health Organization.

Although governments are trying to prevent insects from being transported into their countries, pesticide release into passenger cabins and cargo areas on international flights may get an occasional unwanted pest, but it is highly unlikely that it possesses the vapor pressure that can penetrate luggage or cargo containers. Until foreign governments revise their pesticide spraying regulations on international flights, air travelers will continue to be exposed to pesticides on their travels into these countries.

Flight attendants have expressed their concern for many years about the pesticide spraying, and passengers have complained to the EPA that the spraying has caused headaches, nausea, fatigue, seizures, and in some extreme cases, memory loss or a depressed immune system. In fact, approximately ten years ago a passenger from Great Britain who suffered from emphysema, was on a flight from Canada that was landing in Sydney. His wife requested that he be allowed to leave the plane before spraying, but her plea was denied. D-phenothrin was sprayed, and the passenger died 18 hours later of "acute exacerbation of chronic air-ways obstruction."

Flight attendants have also complained that their health has suffered from pesticide exposure. Marilyn Genz, a retired flight attendant, filed suit against the Department of Health and Human Services maintaining that her health problems, which include liver damage and abnormal clotting of her blood, were caused by nearly 25 years of required pesticide spraying prior to landing.

We are grateful that the Clinton Administration through DOT Secretary Pena has requested that the 27 various governments cease insecticide spraying requirements of arriving aircraft. We also feel strongly that passengers must be notified about the

spraying in advance of their flight. Further, flight attendants should be provided information and training on pesticide spraying and should be provided with protective gloves at and other protective equipment.

Conclusion and Recommendations

I do come today to bring what we consider a new and positive development.

As you know, flight attendants have asked for environmental studies that involved their real world situation for a very long time. Without a systematic data collection program, as recommended by NAS, that measures air flow and contamination in airplane cabins, we are left with the generic sort of studies that do not satisfy flight attendant concerns. The problem seems simple:

> If we have an air quality problem on certain flights, then we need to identify what its source is and attempt to solve the problem. Certainly, it is not in our best interest to have passengers complaining about air quality, nor is it a good working environment for the flight attendants.

The basic prerequisite to ensure the health and comfort of passengers, flight attendants and flight operations personnel is to provide the highest quality aircraft cabin air possible to attain. But also, as employee-owners of TWA, we have a new and vested interest in providing the highest quality aircraft cabin air — and that is the bottom line. We believe there is a financial return to having employees and passengers, healthy and happy. Consequently, TWA jointly with IFFA will conduct a study of selected TWA flights. The selection is being made from flights where flight attendants have expressed concern or experienced problems. Also, we believe this is the first actual flight attendant driven study in the industry. The scope of the study will include carbon dioxide, carbon monoxide, volatile organic compounds, aldehydes, nicotine, airborne particulates, ozone, bioaerosols, temperature, and relative humidity, among other possible areas of concern identified by flight attendants.

The lack of flight attendant input into the ATA survey of 35 flights was one of its major flaws. They did not ask flight attendants to identify those flights that may need to be evaluated. Furthermore, they looked at very little that would be helpful in identifying problems. They went looking for no problems and they found no problems. They did not investigate wide-bodied, international, smoking flights, and their report includes only the averages of the few flights they surveyed.

We believe the cooperative step that TWA has taken jointly with IFFA is the right one.

In conclusion, IFFA and the Teamsters recommend that the FAA:

- Implement the National Academy of Sciences' recommendations including establishing an acceptable program for systematic measurement of air

borne particles and ventilation rates, CO_2 and CO exposure, as well as ozone.

- If design limitations require recycling of cabin air, enforce effective filtration, and strict filter replacement schedules
- Collect data on health effects on crew members
- Assign responsibility for health of crew to an agency such as OSHA
- Establish cabin air quality information training program

The aircraft cabin environment is totally unique. It also, we are told, is one of the most crowded human environments, particularly in some aircraft which exceed 200 persons per thousand square feet of floor area.

The eight years since the NAS report has not resulted in improved air quality, in fact the trend is for more recirculation. Additionally, only one NAS recommendation was acted upon and that was by Congress. It is time to act on those recommendations made eight years ago.

MAY-12-94 THU 18:00 MARY ELLEN IFFA FAX NO. 8162249123 P.01

PLEASE POST ON ALL PILOT BULLETIN BOARDS AND
IN ALL PILOT READ BOOKS

F/C 93-41 DECEMBER 3 1993

SUBJECT: B747 AIR CONDITIONING PACK OPERATING PROCEDURE

AS A RESULT OF RECOMMENDATIONS MADE BY THE FUEL TASK FORCE/ EFFECTIVE IMMEDIATELY THE B747 FHB PROCEDURE FOR AIR CONDITIONING PACK START-UP AND USAGE AFTER TAKEOFF SHALL BE AS FOLLOWS:

- TURN ON THE FIRST PACK AT 400 FEET AGL.
- TURN ON THE SECOND PACK AT APPROXIMATELY 600 FEET AGL.
- TURN ON THE THIRD PACK AT APPROXIMATELY 800 FEET AGL.
- USE THREE PACKS DURING CLIMB AND THROUGH INITIAL LEVEL OFF.

AFTER REACHING INITIAL CRUISE ALTITUDE AND SETTING CRUISE THRUST / SCD / TWO PACKS SHOULD NORMALLY BE USED.

TURN OFF EITHER PACK ONE OR TWO AND MANUALLY CLOSE THE RESPECTIVE INLET DOOR TO REDUCE AIR DRAG.

USE GASPER AND CABIN RECIRCULATION FANS AS NECESSARY FOR PASSENGER COMFORT.

BE ALERT AND RESPONSIVE TO ADVISORIES FROM THE CABIN. ON LIMITED OCCASIONS / SHORT INTERVALS OF THREE-PACK OPERATION MAY BE REQUIRED TO INCREASE CIRCULATION.

THE FUEL TASK FORCE ESTIMATES THAT THE USE OF THIS B747 TWO-PACK PROCEDURE WILL PRODUCE A FUEL SAVINGS EQUIVALENT TO APPROXIMATELY $2 MILLION ANNUALLY. YOUR FUEL SAVINGS EFFORTS ARE APPRECIATED.

FHB CHANGES REFLECTING THE ABOVE POLICY AND PROCEDURE WILL BE ISSUED IN THE NEAR FUTURE.

CAPTAIN
DIRECTOR - FLYING

REMOVE: 31 MARCH 1994

END 1 OF 1

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747

MINIMUM EQUIPMENT AND DISPATCH PROCEDURES

EQUIPMENT ITEM	CAT	NBR INST	APRV	REMARKS
21 AIR CONDITIONING				
−20 Recirculating Fans or Flight Deck Fan	C	4		All may be inoperative.

Priority − 2 (Approved for local Deferral)

Placard per Logbook Placarding Policy (Reference GP&P 1−10−0 and 8−30−1).

In addition, inoperative unit or component must be placarded in flight station.

Maintenance Procedures

NOTE: Information regarding this system is in the 747 Maintenance Manual, Chapter/Section 21−25−00.

None Required.

Robeson

Statement of Robert E. Robeson, Jr.
Vice President, Civil Aviation
Aerospace Industries Association of America, Inc.

Before the House Subcommittee on Aviation

May 18, 1994

Good Morning. My name is Robert E. Robeson, Jr. I am Vice President, Civil Aviation of the Aerospace Industries Association. The AIA is the trade association representing the nation's leading manufacturers of aircraft, engines, components and space systems. I am accompanied today by Tom Nagle, Business Unit Manager, Environmental Control Systems, McDonnell Douglas Corporation, and Neal Nelson, Chief Engineer, Mechanical SYstems, Boeing Commercial Airplane Group.

My testimony today represents the AIA Cabin Air Quality Working Group, and has also been coordinated with Airbus Industrie. The testimony will cover four (4) areas:

1. Aircraft Environmental Control Systems Operations

2. The Cabin Environment

3. Cabin Air Quality Working Group

4. Conclusions

AIRCRAFT ENVIRONMENTAL CONTROL SYSTEMS OPERATIONS

Modern commercial jet transport aircraft range in passenger capacity from less than 100 to more than 500. Flight time can go from less than an hour to the better part of a day. Flight cruise altitudes can be greater than 8 miles (42,000 ft.). The primary requirements for the aircraft environmental control systems are aircraft safety and passenger health. The goals are to provide a comfortable and passenger pleasing environment that is compatible with affordable transportation.

On the aircraft, outside air which has been raised to a high pressure and temperature is extracted from the engine compressor for use in the air conditioning system. This air is conditioned to the required temperature and pressure, and then distributed throughout the cabin. This same air is also used to pressurize the cabin. The amount of air entering the cabin is determined by the number of passengers, the overall heating and cooling requirements, local pressurization requirements as well as overall cabin pressurization requirements. On some aircraft, a portion of the air from the cabin is captured, filtered, and recirculated within the cabin. This recirculation increases air exchange rates and localized air velocity. The "air exchange rate" is the frequency at which the air in a compartment is completely replaced by air from the air conditioning system.

The cabin pressure control system regulates the rate at which the equivalent cabin altitude climbs and descends as well as the maximum altitude at which the cabin will operate. By federal regulation, this maximum equivalent altitude is limited to 8000 feet.

THE CABIN ENVIRONMENT

The air quality environment provided in the modem jet transport aircraft is better and more positively controlled than that in any other mass transit vehicle. As you can well understand, the air in the aircraft when flying is cleaner than any introduced into ground vehicles or buildings. Air exchange rates are several times the rate found in buildings. Air circulation is well controlled as is passenger location. This allows for excellent distribution relative to the occupants. Airflow is developed from ceiling to floor allowing for it to reach passenger head location as soon as possible without collection of odors. Oxygen levels are 30 to 100 times that required physiologically for the support of life. Longitudinal flow of air, fore and aft, in the aircraft is minimized. Aircraft recirculation systems have filtration that is on a par with that found in hospitals. Particle sizes filtered are over 1000 times smaller than those captured in home filters. These on-board filters have no bypass capability. All recirculated air must pass through the filter. Equipment and furnishings within the aircraft are very tightly controlled as are as devices carried onto and operated on the aircraft. This reduces and controls emissions of gasses from these items, while air from lavatories and galleys is vented overboard. In contrast, environmental control systems found in buildings must be capable of protecting the occupants from emissions of all potential furnishings and equipment, over which the designer and building owner have no control.

Aircraft operators and manufacturers monitor their products closely. Any condition warranting correction is approached in a scientific and technical manner. There is no technical evidence that any unsafe or hazardous air quality conditions exist on aircraft. This is reflected in a publication of the American Medical Association, "Medical Criteria for Passenger Flying".

Tests run on aircraft environments support this position. The National Institute for Occupational Safety and Health (NIOSH) of the Center for Disease Control (CDC) conducted an extensive evaluation as a result of complaints of illness symptoms attributed to cabin air quality. The CDC found no lack of oxygen and no toxic exposure. It stated that these results were generally consistent with previous studies. The report went on to conclude, and I quote, "no plausible work-related etiologic exposure that would account for the persistent neurologic findings among some flight attendants was identified".

The air quality is quite similar to what one would experience in a high altitude, mountain area. There are many areas, even well travelled roads, that exceed 8000 feet in elevation. The air within the cabin at cruise is generally dry with humidity levels of 20% or less. These humidity levels are not unlike those found in most regions in the winter and all year long in the southwest USA.

CABIN AIR QUALITY WORKING GROUP

The AIA, Air Transport Association, and American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) together started a Cabin Air Quality Working Group in 1993. The purpose of this group is twofold:

1) To start appropriate action which would result in a sound cabin air quality standard.

2) To begin a program of education which would provide air travellers the insight needed to improve their own comfort level.

ASHRAE was requested to assist in the development of an aircraft cabin air quality standard. The ASHRAE Transportation Committee has established the first forum on the topic, to be held in June of this year. ASHRAE brings to bear some of the most technically qualified individuals in this field to assist in this task. They have already differentiated between buildings and aircraft, demonstrating that this is a common but improper comparison.

The education process has already begun. Manufacturers and operators have generated articles and tests that tell the travelers what to expect and how to best handle air travel. AMA has been contacted and requested to update their publications recommending how doctors should advise patients relative to air travel. Information videos are also under development. In general, the message we are trying to communicate is that as a traveler, you are about to enter a high altitude dry environment for some time. If you are not accustomed to or prepared for this, it can affect you. The altitude and humidity levels may cause dehydration. Symptoms of this are not unlike a mild flu. Travellers should avoid diuretics such as alcohol or caffeinated drinks prior to and during flights. They should consume significant quantities of water and juices, eight ounces for each hour of flight. Passengers should be well rested and should begin before departure to adjust their sleeping schedule. Passengers on long flights should walk around occasionally or change sitting positions. Contact lens users should use moisturizing drops. Those that suffer form dry skin should use moisturizing creams, and passengers that have digestive problems should order special meals.

The uninformed would think it would be simpler to add moisture to the air, but they would have forgotten the two primary requirements, aircraft safety and passenger health. High humidity levels result in high condensation rates as moist air gets near the cold skin of the aircraft. When that condensation collects on a cold surface, it turns to ice. Potential freezing of flight-related mechanisms inside the aircraft could result in an unsafe condition. Collection of large amounts of unknown weight (water and ice) is dangerous, and condensation leads to corrosion. Standing moisture and wet parts also breed unhealthful bacteria. For these reasons, humidification is not an acceptable approach.

CONCLUSIONS

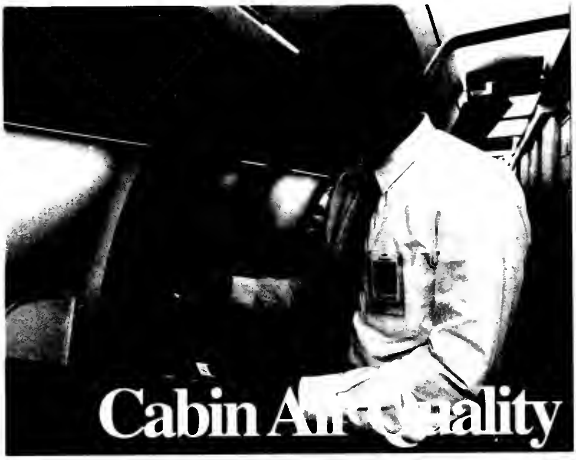
The aircraft manufacturers and operators have taken a strong scientific and technical approach to this area. Many highly qualified individuals have been involved in the development of these systems and all the approaches are quite similar. We do not believe that the evidence

currently available indicates that new regulation in this area is warranted. However, if a decision is made to examine the need for rulemaking, then this issue should be assigned to the appropriate Aviation Rulemaking Advisory Committee Issues Group where all interested parties would have the opportunity to reach a consensus. We would further urge that any regulation should be based on a standard that defines the air quality to be achieved.

Once that technical standard has been defined, the manufacturers must be free to develop the best, most efficient means for meeting the standard. This is important because the best means for reaching the standard may differ between aircraft types depending variables such as typical flight profiles and passenger loads. For example, local flights around the Hawaiian Islands have a maximum flight time of about 20 minutes. The requirements for these flights are likely differ from the requirements for flights that last 15 or more hours.

A flexible approach will enable the manufacturer to work with the operators to find the most effective and efficient solution. Studies are always ongoing by manufacturers to improve products in these areas. A regulation that defines a solution could well have the unintended effect of stifling further innovation in our efforts to improve cabin air quality.

CABIN AIR QUALITY



Boeing Engineer taking relative humidity measurements

David Space
Senior Engineer
Environmental
Control Systems
747/767 Division

Cabin air quality is a complex function of many parameters including ambient air quality, the design of the cabin volume, the design of the ventilation and pressurization systems, the way the systems are operated and maintained, and the presence of sources of contaminants and the strength of such sources.

INTRODUCTION

The purpose of this article is to provide the latest information available on cabin air quality aboard Boeing commercial airplanes, obtained from independent scientific investigations and investigations conducted by Boeing. Additionally, this article addresses some of the conflicting information that has recently been written on this subject and provides insight on the design approach and philosophy taken by Boeing to insure satisfactory cabin air quality.

The news media has on occasion attributed fatigue, dizziness, nausea, headaches, eye and nose irritation and respiratory problems to low fresh air ventilation and the use of recirculated cabin air. These claims are not supported by credible scientific investigations conducted by the National Academy of Sciences, Department of Transportation (DOT) based on data taken on 92 randomly selected revenue flights, independent research groups or Boeing (see References for list of corresponding studies). It is more likely that the above symptoms are caused by interaction between stressors: the individual's health, overeating, alcohol consumption, smoking, motion sickness, inactivity, stress, normal cabin altitude, low relative humidity and high particulate levels in the smoking section(s) on flights that allow smoking.

Furthermore, it has been written that jet lag is caused by high CO_2 concentrations in the passenger cabin. Boeing has not been able to corroborate this from any published literature, governmental or private, nor is it agreed that cabin CO_2 levels are excessive. Boeing and DOT have conducted studies of cabin air quality on many revenue flights during which CO_2 was measured and deemed to be well within norms. The main cause of jet lag is traveling to a different time zone without giving the body a chance to adjust to new night - day cycles (Circadian Rhythm Upset).

CONTAMINANTS AND OTHER PARAMETERS OF THE AIRPLANE CABIN

Airflow

The total volume of air is exchanged approximately every two and one half to three minutes in a wide-body airplane and every two to three minutes on a standard-body airplane. The airflow per unit length of the airplane for the first class and business class sections is not increased over the economy class section. The reason economy class has lower airflow per passenger is due to an increased seating density compared to first class and business class seating densities. A high air exchange rate and sufficient quantity of fresh air must be supplied to each cabin zone to maintain air quality, control temperature gradients, prevent stagnant cold areas and dissipate smoke and odors in the cabin. The flight deck is provided higher airflow per person than the cabin in order to positively pressurize the cockpit to prevent smoke ingress from adjacent areas (abnormal condition), provide cooling for electrical equipment, account for increased solar loads and night heat loss through airplane skin and windows and to minimize temperature gradients.

Current-production Boeing airplanes provide approximately 50% conditioned (fresh) and 50% recirculated air to the passenger cabin on a continuous basis.

The recirculated air is cleaned (filtered) by drawing through high efficiency recirculation filters; the filters cannot be bypassed. The air distribution system is designed to provide approximately 10 cubic feet per minute (cfm) fresh and 10 cfm recirculated air per passenger. Fully loaded all tourist class passenger airplanes (worst case - maximum seating density throughout airplane) can have a fresh air quantity per passenger of 6.5 cfm (standard-body) to 8 cfm (wide-body). Fresh air ventilation rates of 5 to 7 cfm per person have been established as providing satisfactory air quality for other types of vehicular travel that have nonsmoking sections, including passenger and commuter trains and subways. It should be noted that the large majority of airplanes currently flying are not of an all tourist class seating density configuration.

Increasing the quantity of fresh air beyond 50% to the cabin is not necessary. If done, it would lower the cabin CO_2 concentration slightly, but would also increase the potential cabin ozone concentration and lower the cabin relative humidity. Consequently, an airplane's Environmental Control Systems are thoroughly scrutinized throughout the design, analysis and testing phases to fully optimize the systems to first supply the correct amount of air to the passengers for health and comfort, and second, to minimize fuel consumption. Figure 1 provides a schematic of the Environmental Control Systems for the Boeing 767 airplane.

The fresh air quantity supplied to some models of Boeing airplanes can be lowered by shutting off one Air Conditioning Pack. The availability of Pack controls to the flight crew is to provide flexibility to deal with system failure or special use of the airplane. Boeing recommends full operation of the Packs when passengers are onboard.

Environmental Tobacco Smoke (ETS)

Environmental tobacco smoke (ETS) generated from cigarette smoking, is a complex mixture of gas and particulate-phase contaminants made up of more than 3,800 compounds.

A cabin crew survey conducted by a European airline indicates that smoky air caused by ETS is their number one complaint.

Currently, there are no direct governmental, occupational or ambient standards for ETS in any environment. An indirect method to control ETS in the cabin is to control the concentration of Carbon Monoxide (CO) and Respirable Suspended Particulates (RSP) which are tracer constituents of ETS and for which standards do exist. This method does not take into account other constituents present in ETS. Measured CO levels in the smoking section(s) of airplanes during peak smoking are well within acceptable standard limits. RSP concentrations in the smoking sections can exceed recommended RSP levels during peak smoking; this is true

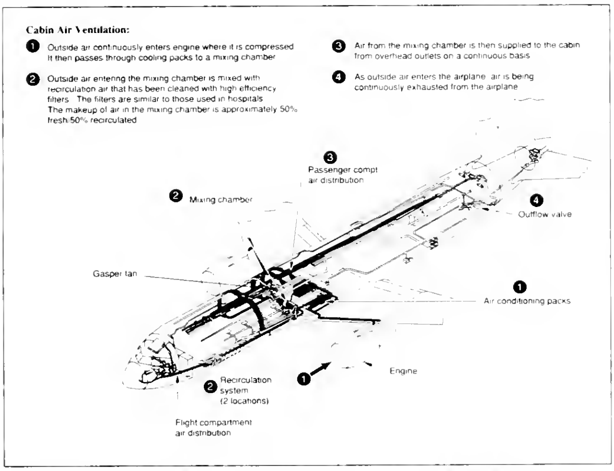


Figure 1. This illustration of a Model 767, shows the typical components and system layout for the Environmental Control Systems.

of most heavy smoking areas, e.g. restaurants, bowling alleys, etc.

The National Academy of Sciences recommended banning smoking on U.S. Domestic flights in 1986 to eliminate the possibility of fires caused by cigarettes, lessen irritation and discomfort to passengers and crew and reduce potential health hazards associated with ETS by bringing the cabin air quality of the smoking section into line with established standards regarding air particulate limits (ASHRAE (Canada) limit for RSP is 100 µg/m3). Average RSP values of 40 µg/m3 and 175 µg/m3 were measured in the nonsmoking and smoking sections respectively, of the 92 airplanes tested in a DOT sponsored study. Smoking was initially banned on U.S. Domestic flights in 1988 for flights of less than two hours, smoking was banned on all domestic flights of less than six hours in duration in 1990.

Boeing airplanes are within recommended guidelines for air particulate concentrations in the nonsmoking sections of the airplanes.

Ozone

Ozone is present in the atmosphere as a consequence of the photochemical conversion of oxygen by solar ultraviolet radiation. A marked and progressive increase in ozone concentration occurs within the flight altitude of commercial airplanes.

The mean ambient ozone concentration increases with increasing latitude, is maximal during Spring (Fall season for Southern latitude), and often varies with weather systems to result in high ozone plumes descending down to lower altitudes.

Residual cabin ozone concentration is a function of the ambient concentration, the design of the air distribution system and how it's operated and maintained and whether or not catalytic ozone converters are installed.

Cabin ozone limits are set by FAR 121.578 and FAR 25.832. The use of catalytic ozone converters is generally required on airplanes flying mission profiles where the cabin ozone levels can be predicted to exceed these FAR limits (refer to the FAA Code of Federal Regulations for other compliance methods).

Cabin ozone measurements were well below FAA limits on all 92 randomly selected flights tested in the DOT air quality study and on flights tested by Boeing.

Microbial Aerosols

Biologically derived particles that are known to become airborne include viruses, bacteria, actinomycetes, fungal spores and hyphae, arthropod fragments and droppings, and animal and human dander.

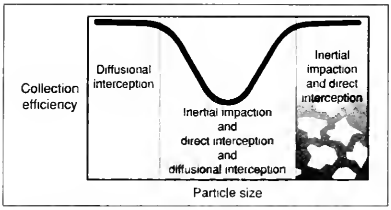
Some articles imply that it is highly likely that if someone on a flight has an active case of an infectious disease like influenza, then other people on board will also have the disease by the end of the flight. Only one study has clearly documented the occurrence of an outbreak of infectious disease related to airplane use. In 1977, because of an engine malfunction, an airliner with 54 persons on board was delayed on the ground for 3 hours, during which the airplane ventilation system was reportedly turned off. Within 3 days of the incident, 72% of the passengers became ill with influenza. One passenger (the index case) was ill while the airplane was delayed. Documentation of this outbreak was assisted by the fact that all the passengers traveled to one small town and were treated by the same local physician.

By shutting off the airplane ventilation system (airplane had 100% fresh air system), an abnormal situation occurred which likely resulted in increasingly high concentrations of microbial aerosols, CO_2 and high temperatures in the airplane cabin. With the ventilation system shutoff, there was no fresh air being introduced into the cabin to displace microbial aerosols and CO_2 or control cabin temperatures. Boeing believes that had the ventilation system been operating during the delay, the possibility of other passengers becoming ill would have been minimal.

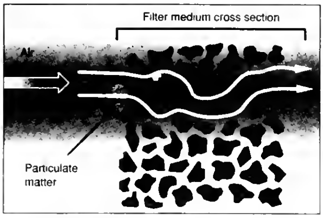
Whether on the ground or in flight, Boeing does not recommend shutting off the airplane ventilation system when passengers are on board, an exception to this is for no Pack takeoffs in which the air distribution Packs are shutoff for a short duration on takeoff only, but not the recirculation fans.

To remove microbial aerosols, dust, lint, etc. from the cabin environment, filter assemblies installed on all current Boeing airplanes contain a High Efficiency Particulate Air Filter (HEPA) that has a minimum efficiency of 91% to 99.9% D.O.P. as measured by MIL-STD-282. A HEPA filter is rated at approximately the most difficult particle size to filter, which is about 0.3 microns in diameter. A filter's efficiency increases over time and due to the overlap of capture mechanisms within a filter (see Figure 2), also increases for particles smaller and larger than 0.3 microns. The efficiency of a HEPA filter to remove 0.01 micron particles from the air is in excess of 99+%. A HEPA filter's efficiency does drop as the particle size approaches that of a gas molecule.

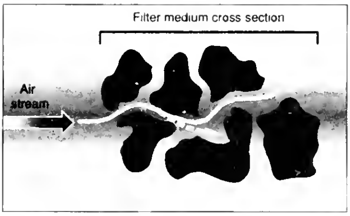
Many bacteria (99% exceed 1 micron in size) are attached to larger particles such as human skin flakes. Viruses generally occur in clusters or in and on other particles (viruses range from .003 to .05 microns). A biology lab at Boeing has analyzed HEPA filters for organic



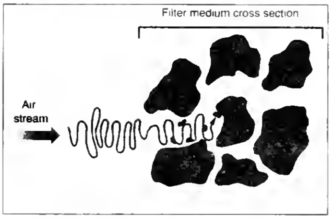
1. Airplane filters are able to remove particles down to the size of viruses 0.01 µm and below. Filters must also remove particles of tobacco smoke, bacteria and particulate matter spanning the range up to 10 µm. To achieve this, several mechanisms of filtration are involved.



2. Direct Interception
Filters consist of matrices with defined pores. If the particles are larger than the pores, they are removed by direct interception.



3. Inertial Impaction
Filters remove particles smaller than the pore size by inertial impaction. Particles of higher density than air deviate from the air flow path and impact on the solid surfaces or walls of the pores, where they adhere. Particles larger than about 0.5µm and up to approximately 10 µm will impact and adhere. Particles less than 0.3 µm will not impact.



4. Diffusional Interception
For very small particles such as viruses, Brownian motion causes particles to be collected on the individual fibres and pore walls. Particles in the range 0.1µm and below are efficiently removed by this mechanism. Airplane filters are designed with media which provide a high efficiency, even for the most penetrating particle size. Passenger and crew protection is assured.

Figure 2. These illustrations show a High Efficiency Particulate Air Filter's (HEPA) capture mechanisms.

Above illustrations courtesy of Pall Land & Marine Corporation

particulate content. Of the filters tested, virtually all organic material was on the surface of the filter and an insignificant amount penetrated into the center of the filter. The medical community uses a similar type of filter to keep the air clean in hospitals.

A study sponsored by the DOT conducted on 92 randomly selected flights, showed levels of bacteria and fungi that were relatively low on all monitored flights. *The levels and genera measured in the cabin environment were similar to or lower than those commonly encountered in indoor environments characterized as normal.*

Volatile Organic Compounds

Volatile organic compounds (VOC) can be emitted by materials used in furnishing the cabin, pesticides, disinfectants and cleaning agents.

In-flight air quality testing was conducted by Boeing on 19 revenue flights. Samples were sent to the University of Washington Department of Environmental Health for analysis by gas chromatography (gas chromatography can dissociate complicated chemical solutions allowing a wide range of air constituents to be isolated and identified).

The gas chromatography studies detected only trace quantities of VOCs at less than quantifiable and identifiable amounts. The low VOC measurements are due to the high cabin air exchange rates (three to five times greater than in

a typical office building) and stringent material off-gassing limits for an airplane cabin.

CARBON DIOXIDE

Carbon dioxide (CO_2) is the product of normal human metabolism, which is the predominant source in airplane cabins. The CO_2 concentration in the cabin varies with fresh air rate, the number of people present, and their individual rates of CO_2 production which vary with activity and (to a smaller degree) with diet and health. CO_2 has been widely used as an indicator of indoor air quality, typically serving the function of a surrogate

CO_2 alone is not a health issue even at the highest levels likely to be encountered in a cabin environment The FAA regulation and industry standards for CO_2 limits are shown in Table 1.

Per DOT sponsored study, measured cabin CO_2 values of 92 randomly selected smoking and nonsmoking flights averaged 1,500 PPM

A CO_2 limit for health factors is provided by the American Conference of Governmental Industrial Hygienists (ACGIH) The Environmental Exposure Limit adopted in 1984-1985 by ACGIH gives 5,000 PPM as the time-weighted average (TWA) limit for CO_2; this value corresponds to a fresh air ventilation rate of 2.3 cfm per person. The TWA is the concentration, for a normal 8 hour workday and a 40 hour workweek, to which nearly all workers can be repeatedly exposed, day after day, without adverse effects. Boeing airplane cabin CO_2 concentrations are well below the ACGIH TWA limit for CO_2 concentration, and this appears to be the most appropriate standard.

The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) defines acceptable indoor air quality as *air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of the people exposed do not express dissatisfaction* The ASHRAE standard is set to satisfy comfort and health requirements, with comfort driving the standard

The ASHRAE (62-1981) standard provides a hard limit for CO_2 itself to satisfy comfort This standard indicates an adequate limit for CO_2 is 5,000 PPM, however, a CO_2 limit of 2,500 PPM was chosen by ASHRAE to allow for a factor of safety in accounting for health variations and some increased activity levels. The minimum corresponding fresh air ventilation rate to meet this CO_2 limit is 5 cfm per person The recommended CO_2 value specified in the new ASHRAE (62-1989) standard of 1,000 PPM serves as a surrogate for odor and control of other contaminants (odor being the driver), and is not a CO_2 specific requirement in itself. It is set to satisfy the odor perception of 80% or more of visitors entering an occupied space.

The new ASHRAE (62-1989) standard for CO_2 does not realistically apply to an airplane environment per se, since it was derived as a surrogate to satisfy visitors entering an environment on a perceived odor basis. In airplanes, passengers enter and stay for long periods and are therefore considered occupants. ASHRAE's reference studies indicate that a much larger quantity of fresh air is required to satisfy 80% of visitors compared to satisfying 80% of acclimated occupants In the airplane cabin, all known contaminants are controlled to lower than harmful concentrations and an over abundance of high quality fresh air is supplied for passenger comfort.

Humidity

Relative humidity is the ratio of the amount of water vapor in the air at a given temperature to the capacity of the air at that temperature.

The relative humidity in the airplanes tested in the DOT sponsored study ranged from approximately 5% to 35% with an average of 15% to 20%. The humidity is mainly made up of moisture from passengers and will increase with more passengers and decrease with increased fresh airflow. A major benefit of recirculated air supplied to the passenger cabin is an increase in cabin humidity compared to airplanes with

STANDARD/ REGULATION	CONCENTRATION LIMIT (PPM)	COMMENT
FAR 25 831	30,000	requirement for aircraft
ACGIH OSHA	5,000	8 hour time weighted average
GOV OF CANADA	3,500	long term exposure range
ASHRAE (1981)	2,500	* 5 cfm person, hard limit
ASHRAE (1989)	1,000	* 15 cfm person, surrogate (odor)

FAR - Federal Aviation Regulation
ACGIH - American Conference of Governmental Industrial Hygienist
OSHA - Occupational Safety and Health Administration
ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers
PPM - Parts Per Million by volume

* Corresponding fresh air ventilation rate to meet CO_2 concentration limit

Table 1. FAA regulation and industy standards for CO_2 limits.

solely fresh air supplied

After three or four hours of exposure to relative humidity in the 5-10% range, some passengers may experience discomfort, such as dryness of the eyes, nose and throat. However, there is no evidence of extensive or serious adverse health effects of low relative humidity on the flying population. In fact, many people live in areas where the relative humidity is in the range experienced in an airplane cabin environment (e.g. Southwestern United States)

Cabin Pressure/Oxygen

At a normal airplane cruise altitude, the air outside the airplane does not contain a sufficient partial pressure of oxygen to sustain normal body function. Consequently, airplane cabins are pressurized to a maximum cabin altitude of 8,000 ft (to compress the ambient air to a form that is physiologically acceptable). The National Academy of Sciences study concluded that *current pressurization criteria and regulations are generally adequate to protect the traveling public*. The Academy also noted that the normal maximum rates of change of cabin pressure (approximately 500 ft/min in increasing altitude and 300 ft/min in decreasing altitude) are such that they do not pose a problem for the typical passenger

However, pressurization of the cabin to equivalent altitudes of up to 8,000 ft, as well as changes in the normal rates of pressure during climb and descent, might create discomfort for some segments of the population such as persons suffering from upper respiratory or sinus infections, obstructive pulmonary diseases, anemias or certain cardiovascular conditions. Supplemental oxygen may be recommended for people suffering from existing medical conditions as mentioned above. Children and infants might experience some discomfort or pain because of pressure changes during climb and descent. Injury to the middle ear can occur in susceptible people, but is rare.

It has been stated in various articles and reports that substandard conditions exist in airplane cabins due to a lack of oxygen. It has been reported that this condition is exacerbated by reduced fresh air ventilation rates or through the use of recirculated air. These arguments imply that the oxygen content of cabin air is depleted through the consumption by occupants. Humans at rest breathe at a rate of approximately 0.32 cfm while consuming oxygen at a rate of 0.015 cfm. The percent oxygen makeup of the supply air remains at approximately 21% at cruise altitude. A person receiving 10 cfm of fresh air and no recirculation air would therefore receive approximately 2.1 cfm of oxygen. Consequently, the content of oxygen in cabin air is little affected by breathing as it is replaced in sufficient quantities compared to the human consumption rate

Although the percentage of oxygen in cabin air remains virtually unchanged (21%) at all normal flight altitudes, the partial pressure of oxygen decreases with increasing altitude, which decreases the amount of oxygen held by the blood's hemoglobin. It is believed that the increase in cabin altitude can lead to low grade hypoxia (reduced tissue oxygen levels) in certain segments of the population and that the main cause of passenger fainting and fatigue is low grade hypoxia in combination with other stressors discussed earlier. However, the National Academy of Sciences concluded that *pressurization of the cabin to an equivalent altitude of 5,000 to 8,000 ft is physiologically safe - no supplemental oxygen is needed to maintain sufficient arterial oxygen saturation*

SUMMARY

Boeing airplanes exceed all applicable regulatory and industry health standards for air quality in the passenger cabin. Recent government, academic and industry studies have concluded that the airplane cabin environment does not pose a health threat to the traveling public. These studies were conducted on airplanes which use the current 50% recirculation type systems as well as older airplanes with 100% fresh air systems

Boeing believes that the more frequent complaints associated with cabin air quality, nausea, headaches, eye and nose irritation, etc., are due to complex interactions of combinations of stressors, i.e. ETS, low relative humidity, motion sickness, cabin altitude, etc.

Boeing will continue to look at new technologies and new ideas and will cooperate fully with the U.S. government in studies on cabin air quality, as has been done in the past, to continuously improve our products

REFERENCES

a. National Academy Press, The Airliner Cabin Environment: Air Quality and Safety, 1986.
b. Report No. DOT-P-15-89-5, Airliner Cabin Environment: Contaminant Measurements, Health Risks, and Mitigation Options, December, 1989.
c. ASHRAE Journal, April 1991, Air Quality, Ventilation, Temperature and Humidity in Aircraft.
d. Boeing Service Letter M-7230-1445, Air Circulation and Air Quality in the Passenger Cabin of 737-300 Airplanes, dated June 10, 1988.

ORLANDO

1994 ASHRAE ANNUAL MEETING

June 26-29, 1994

TECHNICAL PROGRAM

Tuesday

June 28, 1994

8:00 a.m.—10:00 a.m.

ALL 8:00 a.m. SESSIONS ARE CONCURRENT

Seminar-12

Room: Ireland B

Cabin Air Quality on Commercial Aircraft—An Industry Response to Health Issues Associated with Air Travel

Chair: James J. Bushnell, Member ASHRAE, Allied Signal Inc., Torrance, CA
Sponsor: TC 9.3 Transportation Air Cooling
Liaison: Dennis A. Stanke, Member ASHRAE, The Trane Company, La Crosse, WI

This seminar presents the basis for aircraft environmental control system design and compares the performance of many of today's aircraft ECS systems. Some parameters used in aircraft design differ from the proposed legislation and from ASHRAE Standards 55 and 62. The scientific logic behind these differences is explained and an industry standard for aircraft air quality and environment is proposed.

How Aircraft Systems Work—Current Activities Involving Air Quality
Thomas J. Nagle, Member ASHRAE, Douglas Aircraft Company, Long Beach, CA

Current Aircraft Environments and the Relationship to Standard 62
Neal Nelson, Boeing Commercial Airplane Group, Seattle, WA

Improved Aircraft Ozone Converter
Joseph M. Ruder, P.E., AlliedSignal Inc., Torrance, CA

Aircraft Environmental Systems Operations and Maintenance
Don J. Collier, Airline Transport Assn.(ATA), Washington, DC

Forum-21

11:15 a.m.—12:05 p.m.

Room: Scotland A

Should ASHRAE Standard 62 be Applied to Commercial Aircraft?

Moderator: Thomas J. Nagle, Member ASHRAE, Douglas Aircraft Co., Long Beach, CA
Sponsor: TC 9.3 Transportation Air Conditioning
Liaison: Max H. Sherman, Ph.D., Member ASHRAE, University of California, Berkeley, CA

It is apparent that many conditions aboard an aircraft make the air quality requirements for buildings and aircraft quite different. This forum will describe existing system operations and requirements; summarize current activities in the aircraft business; and present a differentiation between existing Standard 62 characteristics and current aircraft ECS performance characteristics.

MEETING SCHEDULE

Friday,	June 24	ASHRAE Registration/ Bookstore Open
Saturday,	June 25	Plenary Session 3:30 p.m. Welcome Party Spouse Hospitality opens International Hospitality opens Committee Meetings
Sunday,	June 26	Technical Sessions begin at 8:00 a.m. Committee Meetings
Monday,	June 27	Technical Sessions Committee Meetings President's Luncheon
Tuesday,	June 28	Technical Sessions Committee Meetings Reception and Inagural Banquet
Wednesday,	June 29	Technical Sessions Committee Meetings

ASHRAE 1994 ANNUAL MEETING, ORLANDO, FL, JUNE 25-29

REGISTRATION FORM—Register by May 20 and SAVE! You can register for the technical meeting or for the "package" that includes the welcome party, president's luncheon, and banquet. **If you cannot mail in your meeting registration by May 20, then wait and register for the meeting at the Buena Vista Palace.**

Last Name First Initial

Nickname (for badge) Phone Number FAX Number

Company Name

Mailing Address

City State/Province/Country Zip/Postal Code

☐ If you have a disability which requires special assistance, please attach a description of your requirements with your registration form to enable us to make appropriate arrangements.

☐ MEMBER #

(Member # must be supplied to receive member pricing)

☐ NON-MEMBER

☐ FIRST TIME MEETING ATTENDEE

PLEASE CHECK THE FOLLOWING THAT APPLY:

☐ 1 CHAPTER OFFICER
☐ 2 STANDING COMMITTEE MEMBER
☐ 3 TECHNICAL COMMITTEE MEMBER
☐ 4 COUNCIL MEMBER
☐ 5 FELLOW

IF FORM CANNOT BE MAILED BY MAY 20, REGISTER ON-SITE.

ADVANCE PACKAGE REGISTRATION:
(By May 20—includes attendance at the technical program, welcome party, president's luncheon, and banquet)

MEETING REGISTRATION ONLY:
(By May 20—includes attendance at the technical program)

ADVANCE REGISTRATION FEES: REGISTER BY May 20
-registration must be mailed by May 20, ***register on-site if May 20 deadline cannot be met)***

MEETING REGISTRATION	PACKAGE REGISTRATION		
☐ $145 ($190)*	☐ $270	3	MEMBER
☐ $190 ($250)*	☐ $315	4	NON-MEMBER
☐ $30	☐ $155	5	SPOUSE ________ name for badge
☐ $15	☐ $140	6	FULL-TIME STUDENT (non-member) ________ name of school
☐ $0	☐ $125	60	SPEAKER/SESSION CHAIRMAN
☐ $0	☐ $125	61	LIFE MEMBER
☐ $0	☐ $125	62	ASHRAE STUDENT MEMBER ________ name of school
☐ $0	☐ $125	64	ORLANDO HOST COMMITTEE
☐ $0	☐ $125	65	PRESS

(Non-members may apply the difference between member and non-member registration fee to the membership application fee of $85 if a copy of the meeting registration receipt is submitted within 60 days of the meeting)

	SOCIAL EVENTS	QTY.	BY MAY 20	TOTAL	ON-SITE
	Saturday, June 25				
20	Welcome Party 6.30pm	____	@$50	____	($52)*
	Children's Ticket	____	@$33		
	Monday, June 27				
21	President's Luncheon 12 30pm	____	@$25	____	($26)*
	Tuesday, June 28				
22	Banquet 6.30pm	____	@$50	____	($52)*
23	Life Members' Luncheon 12noon	____	@$25	____	($25)*
	TOURS (limited space per tour)				
	Sunday, June 26				
25	Cypress Gardens	____	@$35	____	($36)*
26	Leu Gardens/Orlando Museum	____	@$24	____	($26)*
	Monday, June 27				
27	Winter Park	____	@$22	____	($24)*
	Tuesday, June 28				
28	Kennedy Space Center	____	@$32	____	($34)*
	TECHNICAL TOURS (limited space per tour)				
	Monday, June 27				
29	Cape Kennedy	____	@$20	____	($22)*
	Tuesday, June 28				
30	Publix Grocery	____	@$20	____	($22)*
31	**TRANSACTIONS** (available January 1995)	____	@$98	____	($98)*

*on-site registration fee—payable in Orlando at ASHRAE registration desk

GRAND TOTAL $________ payment must accompany registration form (registration fees, social events, tours, transactions)—if form and payment are not mailed by May 20, then wait and register on site.

METHOD OF PAYMENT:

☐ CHECK ENCLOSED—(Payable to **ASHRAE/ORLANDO '94**) U.S. FUNDS ONLY

☐ CHARGE $________ ☐ VISA ☐ MasterCard ☐ AMEX ☐ Diners Club

CARD NO. ________ EXP DATE ________ SIGNATURE ________

Send registration form and payment to: Meetings Section, ASHRAE 1791 Tullie Circle NE, Atlanta, GA 30329. Phone 404/636-8400 FAX 404/321-5478. **Payment must be sent with**

EXECUTIVE SUMMARY as of May 17, 1994

AIRCRAFT CABIN ENVIRONMENTAL SURVEY

John Spengler, Ph.D., Harriet Burge, Ph.D.,
Tom Dumyahn, Carrie Dalhstrom,
Mike Muilenberg, Don Milton, M.D.,
Sue Ludwig and Robert Weker
Department of Environmental Health
Harvard University School of Public Health
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Boston, MA 02115
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There is a general perception among many passengers and flight crew that flying on commercial aircraft is unhealthy. Respiratory complaints are among the most common. For many of us, the prospect of being confined to a small noisy space ($\approx$2 m^3/person) and breathing dry, conditioned air at pressures comparable to that at altitudes up to 8000 feet is something we endure as a necessity of modern travel. Most of us, unaware of the real and documented hazards of increased exposure to ozone and radiation, express concern about the also real possibility of airborne infection. Knowledge that the new generation of aircraft have recirculated air to reduce the cost of providing 100% outdoor air ventilation has only heightened those concerns. In recent years, professional engineering societies have revised ventilation standards towards increasing fresh air in recognition of dissatisfaction with previous codes. On the other hand, aircraft designs have actually reduced the fresh air delivery capacities of the environmental control units (ECUs). Passengers and cabin crew on a plane nearly full to capacity receive less than half the outside air per minute per person recommended for offices and schools.

Reduced amounts of outdoor air do not necessarily translate to poor air quality and increased risk of disease. Air cleaning and removal of pollutant sources mitigate some of the effects of decreasing dilution air. Even with recirculating ventilation systems oxygen is not depleted, nor does carbon dioxide increase to levels that interfere with respiration. Of concern, however, is the adequacy of the strategies used (i.e., recirculation and filtration) to offset the effects on air quality of reducing the amount of outdoor air produced. The effectiveness of filtration is based on the efficiency with which relevant particles and gases are removed from the recirculated air. This efficiency is determined by the type of filters, air flow through filters, and by the pattern and rate of air movement in the cabin. However, the practical effectiveness of the ventilation system is ultimately determined by the human response and, therefore, includes additional characteristics of the cabin environment, such as air mixing, direction of bulk air flow, temperature, humidity, draftiness, turbulence, and odors in addition to actual contaminant levels.

METHODS

To begin to assess the condition of air in commercial passenger aircraft, we conducted a survey in which we measured a variety of parameters over the duration of 22 flight segments. The survey, which took place between March 12 and April 19, 1994, included 8 domestic airline carriers and was designed to contrast planes with and without recirculating air handling systems. Flights were made on McDonnell-Douglas, Boeing and Airbus manufactured aircraft. Flights with the highest projected occupancy were selected. The mean load factor was 79.4% but the median value was 90.6%. Measurements were made and samples were collected in the coach section (front and rear). When they asked, cabin flight crew were briefed, but generally pilots were not informed to ensure that environmental controls were not altered. The survey included east-west as well as north-south routes with most flights lasting at least two hours.

Since we were interested in the overall "trip experience", recording of temperature, pressure, relative humidity, carbon monoxide and carbon dioxide began in the terminal prior to boarding and continued through arrival into the next terminal. Carbon monoxide (CO) was selected as an indicator of combustion. Carbon dioxide (CO_2) in the absence of combustion is primarily generated by passengers and crew and provides an indication of the amount of outdoor air provided per person on the aircraft. Temperature and relative humidity are basic comfort parameters, while pressure serves as a record of flight conditions and is needed to correct CO_2 readings.

Continuous measurements were made with a Metrosonics aq-501 Air Quality Monitor. Carbon monoxide and carbon dioxide monitors were calibrated (two or three points) before and after each trip. Pressure was recorded using a Qualimetric linear output barometer. Data was stored as one minute averages and downloaded into Lotus spreadsheets for quality assurance/quality control screening and temperature/pressure correcting CO and CO_2 data.

Airborne bacteria were collected with calibrated Portable Burkard spore traps. These samplers accelerate airborne particles through a sieve plate and impact those particles with a diameter above about 1 μm onto a 100 mm diameter agar-filled Petri dish (in this case, R2A, a broad-spectrum bacteriological medium). Samples were exposed for 2 minutes with flow rates ranging from about 44 to 52 Liters per minute. The exposed Petri dishes were incubated at 30°C for 5 to 7 days. Bacteria were counted (predominant types were Gram stained) and numbers converted to bacterial colony forming units (CFUs) per cubic meter of air. Airborne bacteria were collected in the terminal just prior to boarding. Shortly after the doors were closed and prior to take-off another set of bacterial samples were collected from the front and rear of the coach section. Another set of paired samples were collected during cruise and again while the plane was taxiing to the gate. Additional sets of paired samples were sometimes collected during cruise and while deboarding was occurring.

Using a hand-held portable dust collector fitted with a cloth collection bag, dust from the carpet and seat was collected on 12 flight segments. Samples were collected over approximately 4-5 minutes and yielded up to 2 grams of dust. Large particles were removed by sifting the dust through a 425 µm mesh sieve. Portions of this dust were sent to VESPA Labs for cat and mite antigen testing. A portion was retained for fungal and endotoxin testing. Fungi were recovered by suspending the dust in an aqueous solution and spread plating the suspension onto malt extract agar (MEA) and incubating at room temperature for 5 to 7 days. Fungi were identified to genus and reported as fungal CFUs per gram of dust. Endotoxin levels in 6 dust samples were analyzed by a Limulus-based method developed for analysis of environmental samples. Details of laboratory procedures are reported elsewhere.

During the cruise period of six flights, 2-hour long integrated air samples for VOC analysis were collected using Summa stainless steel canisters. Canisters were sent to Performance Analytical, Inc. where they were analyzed according to EPA's TO-14 GC/MS for 55 volatile organic compounds. Using a GC/FID, 50 compounds were examined which were considered to be ozone precursors in urban air. An additional 15 compounds were quantified.

In a related survey, we have deployed passive ozone badges (Koutrakis et al. *Analytical Chemistry* 65:209-214; 1993) on close to 100 trans-Pacific flights. The study protocol varied over the course of the year-long investigation, providing information on integrated ozone concentrations over the duration of the flight (up to 15 hours per flight) and for periods as short as 3 hours. The three-hour segments were when the aircraft was flying over the Aleutian Islands. On several flights, up to four locations in the plane were monitored. The badges were analyzed by ion chromatography in Harvard laboratories according to established protocols.

RESULTS

During cruise, average carbon dioxide levels on flights with partially recirculated air were up to twice the levels measured on planes with 100% outdoor air systems. CO_2 averaged 1500 ppm during flights with recirculation indicating that each passenger was receiving 8-10 cfm outdoor air. During the flight on which we operated two CO_2 monitors, the CO_2 concentrations in the rear of the coach were higher, suggesting a front to rear movement of air. An additional 6 flights will be examined to see if this is a consistent finding. During boarding and deboarding CO_2 was substantially higher than during cruise, with levels of 2000 ppm to 2500 ppm being typical. The boarding and pre-takeoff process varied in duration but usually lasted 30 minutes $\pm$ 15 minutes. In addition to CO_2, both relative humidity and temperature increased during boarding and deboarding. Conditions improved when the ECUs started to operate. Temperatures were comfortable, 73°$\pm$2°F, during flight but, as was to be expected, the air was quite dry with relative humidities in the range of 10% to 20%. Planes with recirculating

ventilation systems tended to have higher relative humidities than those with 100% outdoor air systems.

Carbon monoxide concentrations were low ($\leq$ 1 ppm) during flight. Higher levels, 3-7 ppm, were typical of airport conditions, but no measurements indicated levels of concern.

Pressure ranged from 720 mb to > 1000 mb (sea level pressure 1013 mb). Pressure varied in a regular pattern dropping to a typical value of 800 mb ($\approx$ 7500 ft) during the first 30 minutes of ascent and remained steady until the beginning of descent.

Noise level readings, on the dBA scale, with an Extech model 407735 sound level meter were taken on several flights. Noise intensity varied in the coach section depending on engine location and power setting. Typical values were 80-85 dBA but levels were higher in window seats and in the back of the plane with rear mounted engines. Flight peak readings often exceeded 100 dBA (110 max).

Of the 55 targeted volatile organic compounds (VOCs), 27 were quantified above detection limits. Additional compounds were also quantified using a second method. The most abundant organic compound was ethyl alcohol (150-2300 ppb) followed by acetone (29-61 ppb), tetrahydrofuran (3-100 ppb) and isopropyl alcohol (12-80 ppb). Compounds found in fuels, blowing agents, cleaners, plastic and grease solvents, cosmetics and scents were detected in varying concentrations. The 100% fresh air ventilation plane had fewer VOCs detected and consistently lower concentrations than the other five flights which all had recirculating air handling systems.

Over 500 airborne bacterial samples were cultured. At the time of this writing, approximately half of the culture plates had been analyzed. Bacterial counts ranged from 46 to 9936 cfu/m^3 Overall, the concentrations were slightly higher in the terminal than during any of the segmented flight samples except the 3 samples collected during actual deboarding. The samples collected in the terminal averaged about 450 cfu/m^3 compared to onboard values of 200 to 400 cfu/m^3. Overall, bacterial counts on planes with recirculating air handling systems tended to be higher than those for 100% fresh air planes. The difference was most prominent for the samples collected in the front of coach. This spatial difference was apparent on aircraft with both types of ventilation systems and for each of the segmented samples. The highest bacterial counts occurred during active deboarding as passengers were retrieving luggage and leaving. Only a few samples (3) were collected during active deboarding because of the difficulty of doing so. This was anticipated and hence not considered a component of the standard survey protocol. These three samples ranged between 580 to nearly 10,000 cfu/m^3. Bacteria recovered were those typically shed from human skin and mucous membranes, and levels were within the range commonly seen in public environments (schools, office buildings).

All dust samples had measurable quantities of cat and mite antigen. Der pI, the common mite antigen of the Northern U.S., ranged between 0.1 and 1.9 μg/g. Fungal levels in dust were within the range commonly found in homes. Yeasts were more abundant in aircraft dust than is usual for other public environments. Endotoxin concentrations were recovered from dust in levels ranging from 150 to 450 EU/mg. These levels are within the upper range for house dust, and the mid range for cotton dust, a known source for disease-causing endotoxin aerosols.

DISCUSSION

Conclusions from this survey should be considered preliminary, and not comprehensive. For example, we did not sample for radiation or pesticides. A recent study by Wilson et al. (*Health Phy* 66[5]:493-502; 1994) reported annual radiation dose to domestic crew members between 1.0 and 1.8 mSv which has increased in the ten years since the previous survey. They calculate that the international crew might receive up to 3.8 mSv annually. We would expect the crew of North American carriers would receive more radiation than Australian crews because of latitudinal differences in routes.

Further, neither our survey nor any other study that we have found has adequately characterized exposure to infectious agents (viruses, TB, etc.) Sampling for infectious agents is problematic because of variability in sources, the low level of exposure necessary to cause disease, and difficulty with sampling methods. Nevertheless, given the recent Center for Disease Control findings on a tuberculosis case study and other reports about transmission of infectious viruses on aircraft (Moser et al. *Am J Epidemiol* 110:1-6) and air-conditioned barracks (Brundage et al., *JAMA* 259[14]:2108-2112), it is important to pursue this issue further.

We can conclude that ASHRAE 62-89 ventilation standards for offices are not being met in airplanes with recirculating ECUs. This does not necessarily imply adverse conditions. Filtration can effectively mitigate some potential exposures and source control may be effective for agents that are not shed from passengers and crew. However, we found that the lowest outdoor air amounts were during the period of boarding. The auxiliary power units and ground ventilation systems appear to be insufficient to adequately ventilate planes. It is at these times that people are most likely to be actively stirring up dust and shedding bacteria, spores, and allergens from clothing and skin.

None of the volatile organic compounds (VOCs) found on-board the airplanes in this limited study were in sufficiently high concentrations individually to explain reported problems. The concentrations of total non-methane hydrocarbons is quite high and exceeds the concentrations associated with sick building complaints of eye and mucosal irritation. The mixture of VOCs is quite different on planes than reported for other environments with ethyl alcohol being the single most abundant compound. The mixture

of VOCs includes effluents from passengers, cleaning compounds, structural components and furnishings as well as evaporating and combusted fuels. While transient levels of VOCs might be annoying (e.g. jet fuel, ground operations, fingernail polish), at this time we do not see an obvious association between VOCs and health complaints. However, the eye and respiratory irritation of ethyl alcohol in combination with acetone, isopropyl alcohol, and other chemical compounds should be tested.

Analysis of the carpet and seat dust samples revealed the presence of allergens and irritants. The presence of cat allergens in aircraft dust is not surprising considering its ready carriage on clothing and the sporadic presence of cats in the cabin. Mite allergen recoveries were more surprising and the presence of these two allergens may contribute to complaints in sensitive passengers and crew. Endotoxin, a component of the cell wall of Gram-negative bacteria, is a toxin that binds to some cells in the lung, and when inhaled in sufficient quantities can lead to airway inflammation. There is a plausible biological connection that can be made between endotoxin exposure and some respiratory irritation reported from passengers and crew.

Minimizing exposure to allergens and respiratory irritants would involve reducing the sources by limiting access of cats to the cabin, and upgrading maintenance (cleaning) practices to decrease the amount of dust in the cabin. Reducing exposures to airborne organic compounds is more difficult. Passengers themselves can be the source of bioeffluents and emissions from personal care products. Since in these cases source control is impossible, only ventilation with fresh air or air cleaning will reduce the levels. Other compounds, some of which will contribute to the irritating effects of mixtures, are associated with fuel evaporation and/or combustion, cleaning agents, plasticizers, solvents, foams, de-icers, hydraulic fluids, deodorizers and insecticides among other materials. Should additional studies indicate that complex mixtures of organic compounds, together with low humidity, contribute to discomfort and/or adverse health symptoms, the aircraft manufacturers and the airline industry will have to consider more carefully the selection of materials and cleaning agents as well as reviewing maintenance practices.

Low fresh air supply during boarding resulted in elevated CO_2 levels. When passengers and crew are subjected to these conditions for an extended period of time, discomfort symptoms will be experienced. Exposures to airborne dust, biological agents, and organic compounds are expected to be highest during this time. The airlines should investigate procedures to improve ventilation during boarding and other ground activities.

It is evident from our investigation that aircraft ventilation systems are not balanced by sections of the cabin. If it were intended by design to have the ventilation system zonally balanced, then aircraft manufacturers should investigate why this objective is not met in practice.

In our separate ozone survey, we found that, although the aircraft flying the Pacific routes were theorteically equipped with ozone destroying catalytic filters, our results clearly show the presence of elevated ozone. A substantial fraction of the flights, between 10% and 20%, had either the three-hour or flight-integrated ozone levels exceeding 100 ppb. Prolonged exposure to ozone at these levels has been shown to reduce lung function and cause eye and airway irritation. Human data suggesting chronic effects of ozone is insufficient to say with certainty that permanent damage is occurring. However, tests with animals show that chronic ozone exposure results in tissue damage, loss of elastic recoil, and increased collagen deposition at the bronchiolar level.

CONCLUSION

Some flight attendants and passengers complain of symptoms associated with sick buildings syndrome as well as cases of infectious disease assumed to be acquired on flights. Our survey combined with a previous DOT survey and data from the literature have provided some possible explanations for some symptoms. However, additional work is needed (1) to discover the actual rate of discomfort and disease resulting from air travel, (2) to document exposure (with air samples) to dust-borne endotoxin, and (3) to evaluate efficacy of remedial measures (e.g. improved cabin maintenance) that might be instigated.

ACKNOWLEDGEMENTS

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WELKER

TESTIMONY OF BETH WELKER
INTERNATIONAL FLIGHT ATTENDANT
TO THE MEMBERS OF THE SUBCOMMITTEE ON AVIATION
MAY 18,1994

My testimony is on behalf of the thousands of international flight attendants who are exposed daily to deadly tobacco smoke in our workplace. The long awaited EPA report released in January, 1993 left no question as to the harmful effects environmental tobacco smoke has on non-smokers. You have heard all the statistics. Environmental tobacco smoke causes lung cancer, heart disease, and respiratory infections. The list goes on and on. I am here to testify of their impact on commercial airline employees and the flying public. My coworkers and I are developing the serious, life threatening health problems brought to light by the EPA and the medical profession.

Within six months of flying international routes I began developing frequent and severe upper respiratory infections and bronchitis. On every flight, after about a half hour of work in the smoking section or in the non-smoking section of flights with heavier smoking passengers, my eyes became red and watery, my throat began to hurt, and I would develop a deep, repetitive cough. Frequently, this was accompanied by headaches and nausea. This necessitated monthly visits to doctors whose only solution rested in the prescription of antibiotics and drugs. After six months of this continued suffering, I sought out a specialist who determined my health problems were due to my exposure to environmental tobacco smoke. He prescribed Seldane-D, which is a decongestant, and Beconase, which is a steroid that I am forced to inhale twice daily. I do not like having to take such medications because of the side effects, however, I must do so if I am to continue working in this toxic environment. My experience is not unique. I have personally spoken with hundreds of flight attendants who have, or know other flight attendants who have, health problems similar to or much worse than my own. Lung cancer is one unfortunate example.

Flight attendants concerned and harmed by our toxic workplace have basically three alternatives: quitting the job, taking medication, or, if even available, working on domestic routes. For many, these alternatives are not possible or attractive.

For most of us the alternative of quitting our job is not economically feasible.

The second alternative, taking medication, is expensive. My medication costs about $1,100.00 per year (a one month's supply of Beconase costs $32.79; a one month's supply of Seldane D costs $61.99 - figures which are exclusive of doctors' fees, and are subject to large co-payment and deductible portions under my medical insurance). In addition to costs, the side effects inherent with most of the prescriptions available render this alternative unacceptable. Keep in mind these drugs only help to relieve irritation. They do not protect us from the long term deadly risk associated with inhaling environmental tobacco smoke.

The third alternative, working only on the non-smoking domestic routes, would entail vastly different work schedules and a dramatic pay decrease, which most flight attendants would not be able to bear. Further, the most junior flight attendants, the "Reserves", have their schedules and routes dictated to them. They have no choice whatsoever. Many flight attendants are hired for their language skills and are committed to international flying

for a certain period of time and cannot fly the domestic routes.

Let us not forget that flight attendants aren't the only ones suffering in the smoke - the passengers, of course, are also adversely affected. On every international flight I see passengers who would otherwise enjoy a pleasurable travel experience with their families rendered absolutely miserable the smoke. I feel especially for the little children. They cough. Their eyes water. Their throats hurt. But I can do nothing to help them because I can do nothing about the smoking. I recently could do nothing to help a precious little four year old girl, allergic to smoke, sitting in the farthest row she could get from the smokers. Yet it was not far enough. She coughed and wheezed until she became sick. Picture this: the smokers puffing away because of their "rights" to do so, while this little girl was in the bathroom throwing up, a direct result of their inconsiderate behavior. In this shared, confined environment, do they really have that right? What about the businessman with asthma who has to be in Frankfurt the next morning for a meeting? What is he going to do? He is going to suffer for eight, nine, or ten hours. All I can do is give him a wet cloth to put over his mouth. And how about the families on their long planned and awaited European vacations who book their seats in the non-smoking section under the false pretense that they will be in a smoke-free environment? From my miles of travel that would probably award me a private Cessna under a frequent flyer program, I know there is no such thing as a non-smoking section in a long metal tube with poor ventilation.

There is no way to adequately separate the smokers from the non-smokers. While the filters are able to remove some of the particulate matter they cannot remove the carcinogens. The toxic air is simply recirculated throughout the cabin. Of course it is worse in the smoking section. Not only do we have to work in the smoking section during the meal services but frequently our coach class galley is located in the smoking section. Usually at least two flight attendants are required to remain in it throughout the duration of the flight to serve passengers and watch for and extinguish the fires potentially caused by careless smokers. This is especially a problem on night flights as many smokers fall asleep with lighted cigarettes.

I am not trying to take the "rights" away from the smokers or usher in a new period of prohibition. But smokers do not have the right to make everyone else in their mutual environment smoke along with them. That is exactly what is happening. The freedom of choice has been taken away from the international traveler. Smokers on aircraft are forcing the health hazards of smoking upon us against our will. We are suffering a great risk we did not choose. We need you, Congress, to help us. The individual airlines are reluctant to act alone on a total ban because they fear losing market share to their competitors although this has never been proven in market studies. We need you to enact a total ban on smoking to ensure a more equal playing field to pacify industry concerns. Be mindful that many industry experts believe airlines might recognize a cost savings associated with paying for flight attendant medical bills and airplane cleaning in a smoking ban. Congress banned smoking on domestic routes and for this we thank you. We now need you to go one step further and ban it on all international routes into and out of the U.S. for the health and safety of passengers and crew.

AMERICAN CANCER SOCIETY® AMERICAN LUNG ASSOCIATION® American Heart Association℠ Fighting Heart Disease and Stroke

Coalition on Smoking OR Health

STATEMENT OF JOHN WHITE, Ph.D.

ON BEHALF OF

THE COALITION ON SMOKING OR HEALTH

TO THE

HOUSE COMMITTEE PUBLIC WORKS AND TRANSPORTATION

SUBCOMMITTEE ON AVIATION

RE: SMOKING ON INTERNATIONAL AIRLINE FLIGHTS

MAY 18, 1994

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Mr. Chairman and members of the Subcommittee, I am Dr. John White, Ph.D., a past president of the American Lung Association. I am speaking today on behalf of the American Lung Association and its partners in the Coalition on Smoking Or Health, the American Heart Association and the American Cancer Society. At the outset, the Coalition would like to thank you, Mr. Chairman, for your leadership in banning smoking on the majority of domestic flights in the United States. The next step is to extend such provisions to international flights. The positions we advocate today were first brought to the attention of this Subcommittee by the American Lung Association a decade ago, August 1984. Since that time our understanding of the air quality in the airline passenger cabin, and specifically the pollutant, environmental tobacco smoke, has dramatically improved.

Today there is worldwide support for eliminating exposure to environmental tobacco smoke in the passenger cabins of all commercial flights, both domestic and international. The Coalition on Smoking Or Health co-chairs, with the Canadian Cancer Society, the Campaign for Smokefree Skies Worldwide, an organization with members representing over 60 countries. It was this organization that spearheaded the successful nongovernmental organization support for the resolution passed by the International Civil Aviation Organization calling for a ban on smoking aboard all international airline flights by July 1, 1996.

Before proceeding with a discussion of efforts to ban smoking aboard international

flights, I would like to briefly describe the advances in our knowledge of the health effects of environmental tobacco smoke. The health, well-being and comfort of hundreds of thousands of airline passengers are jeopardized by cigarette smoking on international flights. Although most airline passengers are primarily affected by the acute, irritating effects of environmental tobacco smoke, some individuals are unable to travel by air because their reactions to environmental tobacco smoke are life-threatening. With flight attendants, for whom this exposure is a regular occupational hazard, the problem, as they emphasize in their comments today, is even more serious. Nose and throat irritation, headaches, dizziness and nausea caused by the heavy concentration of tobacco smoke found in passenger cabin smoking sections, and the recirculation of polluted air throughout the cabin, are an unhealthy fact of life for too many flight attendants.

The exposure of nonsmokers to environmental tobacco smoke poses definite health risks. Over the last four decades, more than 50,000 studies have clearly established the scientific evidence incriminating cigarette smoking as a direct cause of death and disability. Research on the health consequences of exposure to environmental tobacco smoke began in the late 1960s. Today a large and cohesive body of scientific information on the adverse effects of such exposure has been accumulated, culminating in the release of the Environmental Protection Agency's risk assessment, Respiratory Health Effects of Passive Smoking, in January 1993. Based on its risk assessment, EPA listed ETS as a Group A, known

human, carcinogen. The action by the Environmental Protection Agency is supported by other landmark decisions. For example, in 1991, the National Institute for Occupational Safety and Health issued Current Intelligence Bulletin 54, Environmental Tobacco Smoke in the Workplace. NIOSH found environmental tobacco smoke to be a potential occupational carcinogen, its most significant category for human carcinogens.

The findings from the EPA risk assessment include:

- environmental tobacco smoke causes an estimated 3,000 lung cancer deaths and 12,000 non-lung cancer deaths each year;
- environmental tobacco smoke exposure leads to coughing, chest discomfort, and reduced lung function in nonsmoking adults;
- 70 percent of the lung cancer deaths attributable to environmental tobacco smoke exposures are due to exposures outside of the home.

The EPA risk assessment also augmented previous reports with an exhaustive review of the health effects of environmental tobacco smoke on children. Although the tobacco industry has repeatedly tried to refute the findings of this risk assessment as they pertain to the lung cancer risks for adults, the results concerning respiratory disease in children have not receive such attention. The findings for children include:

- environmental tobacco smoke causes between 8,000 and 26,000 cases of childhood asthma each year;
- symptoms of 200,000 to 1 million children already diagnosed with asthma become significantly worse due to environmental tobacco smoke exposures;
- environmental tobacco smoke causes 150,000 to 300,000 cases of lower respiratory tract illness in young children under 18 months each year;
- 7,500 to 15,000 hospitalizations in these younger children result from exposure to environmental tobacco smoke; 15,000 hospitalizations for lower respiratory tract illness would equate to between $45 million and $68 million annually, given the average cost per patient with such a diagnosis.

While these findings were not based on research conducted directly in the airline passenger cabin, there is no reason to anticipate that the health effects of exposure to environmental tobacco smoke would be any different in this environment than any other. Further, the confined structure of an aircraft passenger cabin poses particular problems with respect to air quality. The exposure to environmental tobacco smoke can have a tremendous impact in this enclosed space. The low humidity--approximately 20 percent--and the unusual constraints on air circulation within the passenger cabin exacerbate smoking-related symptoms experienced by the nonsmoker. A dry atmosphere intensifies the irritation of the mucous membrane lining the sinuses and upper respiratory system. This effect is particularly pronounced for persons with allergy, asthma,

respiratory infections and chronic lung disease.

The airline passenger cabin should be viewed as another location in which nonsmokers are unnecessarily and involuntarily exposed to tobacco smoke. For the general public, this exposure adds to that received in other public environments where smoking is unrestricted. For flight attendants exposure to tobacco smoke represents a preventable occupational hazard. Although not covered by the Occupational Safety and Health Act of 1970, it is important to note that the Occupational Safety and Health Administration recently announced a proposed rulemaking on indoor air quality which, in part, would eliminate exposure to environmental tobacco smoke in all industrial and nonindustrial worksites under its jurisdiction. Flight attendants on international flights would remain one of the last groups of workers without protection from the health effects of environmental tobacco smoke.

Representatives of 168 nations to the International Civil Aviation Organization voted at the triennial Assembly meeting in 1992 to prohibit smoking on all international airline passenger flights. The resolution was cosponsored by the countries of Australia, Canada, Pakistan, the Russian Federation and the United States. The resolution calls for all ICAO member states to phase out smoking on international flights no later than July 1, 1996. To promote health and safety,

cooperation among nations and to facilitate effective competition among international carriers, the resolution states that "globalization of air carrier operations requires harmonization of rules on smoking restrictions". The resolution also requests ICAO to develop standards the nations of the world can use to achieve that goal.

Some international airlines, including Air Canada and Northwest in North America, Lauda Air and Scandinavian Airlines in Europe and Cathay Pacific in Asia already offer smokefree international flights. Many nations, including Australia, Canada, Hungary, Japan, New Zealand, the People's Republic of China, Poland, Thailand, Turkey, the United Kingdom and the United States, prohibit smoking on all or lengthy flights. A partial list of smokefree flights is attached.

The Campaign for Smokefree Skies learned, interestingly enough, that while there is considerable concern about the health effects of environmental tobacco smoke, passenger health and comfort were not paramount concerns to the member states of ICAO. Rather, the overriding objective was safety as per the Convention on International Civil Aviation. Having previously reviewed the health concerns about environmental tobacco smoke, it is also important to note the safety considerations arising from cigarette smoking in airline passenger cabins. For example:

- exposure of flight crew and cabin personnel to the high concentrations of carbon monoxide from environmental tobacco smoke over many

hours can cause headaches, respiratory problems, light-headedness and other symptoms that impair performance, especially in the event of an emergency; a May 1991 survey of American Airlines flight attendants found that 48 percent believe exposure to environmental tobacco smoke affects their ability to think and act rapidly in an emergency. These reactions can be traced to possible decreased blood oxygen levels. As cabin altitude increases, the oxygen level in the blood of passengers and crew decreases. Tobacco smoke in the air makes this situation worse. Carbon monoxide from environmental tobacco smoke further reduces the oxygen-carrying ability of the blood.

- open flames and lighted tobacco products present an obvious fire hazard in the airline cabin. Cabin crews report that passengers often fall asleep with lit cigarettes in hand, occasionally dropping the cigarette between the fuselage and seat, resulting in seat cushion fires. Cabin crew members are also burned by carelessly held cigarettes when passing through the cabin. A survey of 750 flight attendants found that 59 percent had seen actual fires or the potential for fires in the passenger cabin from cigarettes. Because of concern about fire hazards, smoking is forbidden in theaters and similar places where the public congregates in enclosed, crowded space with limited

entrances and exits. An airplane is like an airborne theater--only it sits atop thousands of pounds of flammable fuel.

- smoking on board aircraft poses a danger to safety equipment. In at least one documented case, oxygen masks failed to release at a time when the cabin was losing pressure. The equipment failure was attributed to tobacco tar buildup on the latches holding the masks. Air outflow valves also show evidence of tar buildup, a disturbing and potentially dangerous side effect of in-flight smoking. Tobacco smoke also may effect the efficiency of pressurization and air conditioning systems.

- although always a concern, surreptitious smoking has been minimal to nonexistent on existing smokefree long-distance flights, including U.S. military charter flights. Cathay Pacific routinely makes its transpacific flights smokefree without incident including the long flights from Hong Kong to Los Angeles, Hong Kong to Vancouver and Hong Kong to Australia. Standards for tamperproof smoke detectors in lavatories, especially near paper towel receptacles, has greatly assisted in controlling what small problem might exist.

The Coalition on Smoking or Health was very pleased that the United States government was one of the sponsors of the ICAO resolution and supported this decision. However, the resolution, as stated earlier, set the objective of July 1, 1996 for implementation and the Coalition is concerned that the United States government is not moving as rapidly as possible to indicate how it will comply with this stated objective. Implementation of the resolution is a complex process involving the international community and the flag air carriers for a significant number of countries. Beyond discussion of a few bilateral and multilateral agreements, none of which has been completed, the Coalition has seen no action, to date, taken by the Department of Transportation to ensure that U.S. carriers and foreign flag carriers will be in compliance with the resolution by the stated deadline. The Coalition urges this Subcommittee to seek clarification from the Department regarding its planning for implementation of the ICAO resolution.

The Coalition on Smoking or Health remains committed to securing smokefree flights worldwide and stands ready to assist the Subcommittee with this task. The United States has shown leadership with regard to smoking restrictions on domestic airline flights--with the guidance of the Subcommittee, we look forward to a continued leadership role for our country.

Thank you for this opportunity to comment.

International Airlines Smokefree Policies

The following airlines are totally smokefree:

Air Canada
Air Nevada
Air UK
Aloha Airlines
American West Airlines
Balkan Bulgarian Airlines
Capital Airlines (UK)
Flexair (Netherlands)
Hawaiian Airlines
Loganair (UK)
Polynesian Airlines
Ansett New Zealand
Mount Cook Airlines
Oxley Airlines (its international flight is to Norfolk Island)

Some airlines said some or many of their flights were smokefree, as follows (flights by international carriers over Australian, Canadian and US airspace are smokefree for that part of the journey):

Aeroflot:	All domestic flights are smokefree.
Air France:	**No smoking on all flights within France and on international flights shorter than two hours. Enclosed rear cabins on flights to Japan and Korea will be reserved for up to 90 nonsmokers.**
Air Inter (France):	All domestic flights are smokefree.
Air Malta:	Short flights are smokefree.
Air Mauritius:	The one domestic flight is smokefree.
Air New Zealand:	All domestic flights are smokefree.
Air Zimbabwe:	**No smoking on domestic flights.**
Alitalia:	**No smoking on flights within Italy and on international flights shorter than two hours.**
American:	**One flight between New York and London is smokefree.**
Bangladesh Airlines:	**All domestic flights are smokefree and international flights are 25% smokefree.**
British Airways:	All domestic flights are smokefree as are **international flights less than 90 minutes. Two out of three daily flights between London and San Francisco and also London and Los Angeles are smokefree. Hong Kong to London flights are smokefree. One of two flights daily to Johannesburg is smokefree. All flights between Australia and the UK are smokefree.**
Cathay Pacific:	**No smoking on trans-Pacific flights, Hong Kong to London (Heathrow), Japan to Amsterdam, Frankfurt, London, Manchester, Paris, Rome and Zurich, and Australia to Europe.**
China Airlines:	**All domestic flights and some international flights, such as Taipei to Los**

China Airlines:	**All domestic flights and some international flights, such as Taipei to Los Angeles, New York and Asia (except Taipei to Japan) are 100% smokefree.**
Czechoslovak Airlines:	All domestic flights, and flights of up to one hour, are smokefree.
Egypt Al:	All domestic flights, and all international flights longer than five hours, are smokefree.
El Al:	Flights shorter than two hours, including Tel Aviv to Athens, Tel Aviv to Istanbul and Tel Aviv to Cairo, are smokefree
Finnair:	All domestic flights, and flights of up to two hours serving Scandinavian cities, are smokefree.
Icelandair:	All domestic flights are smokefree.
Lan-Chile Airlines:	All domestic flights are smokefree.
Japan Airlines:	**No smoking on flights within Japan.**
Lauda Air:	Flights between Vienna and London are smokefree.
LOT (Poland):	All domestic and international flights shorter than two hours are smokefree. Smoking is prohibited on flights between Warsaw and the following: Prague, Budapest, Vienna, Berlin and Frankfurt.
Malaysia Airlines:	All domestic flights and flights to Singapore, are smokefree, **as well as some regional sectors.**
Maleb (Hungarian Airlines):	All domestic flights and 17 international flights are smokefree.
Northwest Airlines (USA):	All flights to Canada, the Cayman Islands, Jamaica and Mexico are smokefree.
Olympic Airlines:	All domestic flights are smokefree.
People's Republic of China Civil Aviation Administration:	**Flights to Hong Kong via mainland carriers are smokefree; to be extended to all international flights by 1/1/95.**
Quantas:	**Australia to the UK flights are smokefree. Also flights from Australia to Vancouver, Los Angeles, Port Moresby, Bali, Fiji, New Zealand and Noumea.**
Royal Jordanian Airlines:	All flights longer than two hours are smokefree.
Scandinavian Airlines:	All flights within Scandinavia, including Finland, are smokefree. **90% of European flights smokefree (flights up to 150 minutes--instituted, then rescinded after 2 months).**
Singapore Airlines:	**Flights between Singapore and China, New Zealand, Taipei-Seoul, Kuala Lumpur, Australia, India and the United Kingdom are smokefree, for a total of 75% of its service.**
South Africa Airways:	All domestic flights are smokefree. **Nonsmoking section on international flights is 80%, but smoking is allowed on domestic legs of international flights.**
TAP (Air Portugal):	The domestic routes Lisbon-to-Oporto and Lisbon-to-Faro are smokefree.

United Airlines:	**One flight each day between the following cities is smokefree (some start June 8)--Los Angeles to Auckland-Melbourne, Los Angeles to London, San Francisco to London, New York to London, Washington, D.C. to London.**
Virgin Atlantic Airways:	There are two smokefree flights between New York and London each week.
Yugoslav Airlines:	All domestic flights are smokefree.
Zambia Airways:	**All domestic flights smokefree.**

Restricted smoking

The following airlines have restrictions on smoking during flights (especially international ones) on which it is allowed:

Aeroflot:	Most seats are nonsmoking, but segregation is hopelessly ineffective.
Air Inter (France):	Usually 40% of seats are nonsmoking, but smoking is forbidden over US and Canada.
Air Malta:	70% of seats are nonsmoking;
Air Mauritius:	Almost 50% of seats are nonsmoking - except for short flights, during which smoking is forbidden.
Air New Zealand:	83% to 90% of seats are nonsmoking.
Alitalia:	87% of economy-class seats are nonsmoking.
British Airways:	70% of seats are nonsmoking.
Czechoslovak Airlines:	Most seats are nonsmoking.
El Al:	65% of seats are nonsmoking, and the percentage is rising.
Korean Air:	80% of seats are nonsmoking.
Lan-Chile Airlines:	66% of seats are nonsmoking.
LOT (Poland):	On flights longer than two hours, 85% to 90% of seats are nonsmoking.
Lufthansa:	74% of seats are nonsmoking.
Singapore Airlines:	80% of seats are nonsmoking.
Swissair:	75% to 80% of seats are nonsmoking. The percentage is greater on flights to and from Japan.
Varig (Brazil):	35% of seats nonsmoking.
Virgin Atlantic Airways:	78% of the more expensive seats (first class and business class), and 85% of economy-class seats, are nonsmoking.

Sources: Surveys by Nonsmokers Movement of Australia (NSMA) and European Bureau for Action on Smoking Prevention in 1992. Updates are in bold are based on news reports.

PATRICIA YOUNG

AMERICAN AIRLINES FLIGHT ATTENDANT

MAY 18, 1994

LADIES AND GENTLEMEN OF THE COMMITTEE, MY NAME IS PATTY YOUNG, AND I HAVE BEEN A FLIGHT ATTENDANT FOR 28 YEARS. FOR THE LAST 25 OF THOSE YEARS I HAVE BEEN CONSTANTLY WORKING TO HAVE ENVIRONMENTAL TOBACCO SMOKE REMOVED FROM MY WORK ENVIRONMENT.

IT TOOK AN ACT OF CONGRESS TO BAN SMOKING ON MOST DOMESTIC FLIGHTS, AND IT WILL TAKE ANOTHER ACT OF CONGRESS TO BAN SMOKING ON ALL INTERNATIONAL FLIGHTS.

OBVIOUSLY, CONGRESS CAN NOT RELY ON THE AIRLINES TO CREATE A HEALTHY AND SAFE ENVIRONMENT FOR EITHER THE FLIGHT CREWS OR THE PASSENGERS. NOR CAN CONGRESS RELY ON THE FEDERAL ADMINISTRATIVE AGENCIES TO SET PROTECTIVE STANDARDS FOR HEALTH AND SAFETY. THE FEDERAL AGENCIES INVOLVED INCLUDE THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), THE DEPARTMENT OF TRANSPORTATION (DOT), THE OFFICE OF FEDERAL CONTRACT COMPLIANCE PROGRAMS (OFCCP), AND THE FEDERAL AVIATION ADMINISTRATION (FAA). THESE AGENCIES HAVE BEEN NOTHING MORE THAN WHORES FOR BIG BUSINESS.

IT IS A FACT THAT THE AIR LINES ARE MORE INTERESTED IN PROFIT THAN IN THE HEALTH AND SAFETY OF FLIGHT CREWS AND PASSENGERS. PART OF THE PROFIT MOTIVE IS TO SAVE ON THE FUEL COSTS OF MAINTAINING CABIN AIR QUALITY.

IN ORDER TO MAINTAIN CABIN AIR QUALITY, HOT AIR IS TAKEN FROM THE AIRCRAFT ENGINES AND MIXED WITH COLD OUTSIDE AIR TO MAINTAIN CABIN TEMPERATURE. THE MORE HOT AIR TAKEN FROM THE ENGINES, THE HIGHER THE FUEL COSTS. THEREFORE, THE AIR LINES REDUCE THE AMOUNT OF FRESH AIR BROUGHT INTO THE CABIN.

FIVE YEARS AGO, I SPOKE BEFORE A CONGRESSIONAL COMMITTEE CONSIDERING THE BANNING OF SMOKING ON DOMESTIC FLIGHTS. I SAID TO THAT COMMITTEE: "WE, THE FLIGHT ATTENDANTS, ARE NOT A DISPOSABLE WORK FORCE AND WE DESERVE A HEALTHY AND SAFE WORKING ENVIRONMENT."

OBVIOUSLY, I WAS WRONG: WE ARE DISPOSABLE. THE AIR LINES HAVE MADE NO ATTEMPT TO IMPROVE CABIN AIR QUALITY BY BANNING SMOKING ON ALL FLIGHTS. AS A RESULT, FLIGHT ATTENDANTS ARE SICK, DISEASED, DYING AND DEAD FROM ILLNESSES CAUSED BY TOBACCO SMOKE. WE ARE WALKING TIME BOMBS BECAUSE OF THE RAPE WE HAVE BEEN FORCED TO ENDURE IN OUR WORK ENVIRONMENT. EVEN WHEN WE SECURE A SMOKE FREE ENVIRONMENT, WE WILL STILL BE SUBJECT TO TOBACCO RELATED CANCERS AND OTHER ILLNESSES WHICH CAN TAKE UP TO 20 YEARS TO SHOW UP.

SOME OF THE EFFECTS OF MY TOBACCO RELATED ILLNESSES ARE CHRONIC BRONCHITIS, ASTHMA, CHRONIC LARYNGITIS, CHRONIC SINUS DISEASE WITH POLYPS, AND SEVERE DEBILITATING HEADACHES WITH VOMITING AND DIARRHEA. ALSO WHEN I WAS FORCED TO WORK SMOKING FLIGHTS, AT TIMES MY TEARS AND MUCUS WERE THE COLOR OF COFFEE OR TEA. IF THAT WAS THE VISIBLE EFFECT, OBVIOUSLY, THE TOBACCO SMOKE WAS AFFECTING MY ENTIRE BODY.

AS A RESULT OF MY SMOKING RELATED INJURIES, I HAVE BEEN DETERMINED TO BE A PERSON WITH A DISABILITY UNDER SECTION 503 OF THE REHABILITATION ACT AND TITLE I OF THE AMERICANS WITH DISABILITIES ACT. THIS DETERMINATION WAS MADE BY THE OFFICE OF FEDERAL CONTRACT COMPLIANCE PROGRAMS, U.S. DEPARTMENT OF LABOR. THEREFORE, I REPRESENT THE CLASS OF PERSONS WITH DISABILITIES THAT ARE EITHER CAUSED OR AGGRAVATED BY TOBACCO SMOKE. THIS CLASS OF PERSONS WITH DISABILITIES IS EITHER DENIED ACCESS ON INTERNATIONAL FLIGHTS OR FORCED TO ACCEPT SERIOUS HEALTH CONSEQUENCES IN ORDER TO FLY ON INTERNATIONAL FLIGHTS.

THE AIRLINES ALSO BELIEVE THAT IN ORDER TO PROTECT THEIR MARKET SHARE, IT IS NECESSARY TO PANDER TO THEIR DRUG ADDICTED SMOKING PASSENGERS AT THE EXPENSE OF THE HEALTH AND SAFETY OF FLIGHT CREWS AND NON-SMOKING PASSENGERS. THIS CAN BE CONFIRMED BY AN EXAMINATION OF THE AMR CORPORATION OFFICIAL NOTICE OF ITS ANNUAL MEETING OF STOCKHOLDERS.

PROPOSAL 5, A STOCKHOLDER RESOLUTION, PROPOSES THE ELIMINATION OF SMOKING ON ALL AMERICAN AIRLINES FLIGHTS BY JANUARY 1, 1995. THE BOARD OF DIRECTORS OF AMR CORPORATION OPPOSES THE "NON-SMOKING PROPOSAL" AND RECOMMENDS THAT IT BE REJECTED BY THE STOCKHOLDERS AT TODAYS ANNUAL MEETING.

THIS RECOMMENDATION BY THE BOARD OF DIRECTORS COMES AS NO SURPRISE BECAUSE OF PREVIOUS STATEMENTS BY ITS CHAIRMAN, MR. ROBERT CRANDALL. WHEN ASKED BY COMPANY EMPLOYEES IN MANAGEMENT LEADERSHIP MEETINGS WHEN SMOKING WOULD BE ELIMINATED ON ALL FLIGHTS, MR. CRANDALL WOULD SMILE, LIGHT UP A CIGARETTE, BLOW OUT THE SMOKE AND SAY: "DOES THAT ANSWER YOUR QUESTION?"

IN A LETTER SENT TO ME, MR. CRANDALL HAS ALSO EXPRESSED MORE CONCERN FOR THE WELFARE OF TOBACCO WORKERS ADVERSELY IMPACTED BY ANTISMOKING LEGISLATION THAN HE HAS FOR THE HEALTH AND WELFARE OF HIS OWN COMPANY'S FLIGHT CREW EMPLOYEES.

AS A RESULT OF THE TOTAL ABDICATION OF RESPONSIBILITY BY FEDERAL AGENCIES, FLIGHT ATTENDANTS WERE LEFT WITH NO RECOURSE OTHER THAN A WORLD WIDE CLASS ACTION LAWSUIT AGAINST THE TOBACCO COMPANIES. THIS LAWSUIT WAS FILED IN STATE COURT IN MIAMI, FLORIDA BY STANLEY M. ROSENBLATT, P.A.

FLIGHT ATTENDANTS CAN BE BEST COMPARED TO THE CANARIES IN THE COAL MINES, NOTHING MORE THAN A DISPOSABLE WORK FORCE SUBJECT TO THE COMPANY STORE MENTALITY OF THEIR EMPLOYERS.

THEREFORE, CONGRESS MUST ACT IMMEDIATELY TO ELIMINATE THE HAZARDOUS FLYING ENVIRONMENT BY ELIMINATING SMOKING ON ALL FLIGHTS.

Patty Young

Patty Young
4910 W. Hanover Ave
Dallas, TX 75209-3216
(214) 357-6963

Representative James L. Oberstar
2366-RHOB
Washington, DC 20515

Attention: Chairman Oberstar

I am sorry for the delay in answering some questions relating to the hearing on May 18, 1994. These questions are in reference to the aircraft ventilation systems and non-smoking international flights.

Question 1. Are flight attendants in other countries working on their governments as you are on ours, to end smoking on international flights?

Answer: Yes. For example, Varig Airlines (Brazil).

Question 2. (a) Is the captain generally responsive to your appeals to increase the airflow, or (b) do they just blow you off unless they feel it?

Answer: (a) No

Answer: (b) The captain is responsible for fuel management and, as a result, he or she sometimes shuts down the air packs in order to save fuel.

Often the cabin air flow is so low that I can hardly feel air coming out of the air ducts even when the ventilation system is on full force in the cockpit.

Many times the captains that smoke have refused my requests when I have asked for additional ventilation because the tobacco smoke was so bad in the cabin.

*** The ventilation distribution system/ducts are not being cleaned properly if at all. I have removed the cover to the duct system in the galleys because it was so contaminated that it was dropping filth onto the food. When I removed the covers to clean them I observed the interior of the ductwork covered with mold, mildew, and filth-some of it 1/3 inch thick.

During the past week, on trips to Seattle, I had four complaints from passengers and crew that they had breathing difficulties and sinus problems during the trip.

Sincerely, Patty Young

Patty Young

July 14, 1994

ADDITIONS TO THE RECORD

Air Transport Association

James E. Landry
President

June 10, 1994

Honorable James L. Oberstar
Chairman
Subcommittee on Aviation
Committee on Public Works and Transportation
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

At the close of the Aviation Subcommittee hearing on Cabin Air Quality on May 18, 1994, you asked me to return to the witness stand to respond to some questions raised by your final witness, John F. Banzhaf, III, of Action on Smoking and Health. In our brief dialogue, I offered to submit some facts for the record concerning airline practices in dealing with smoking and non-smoking passengers on international flights.

Attached is a copy of the pertinent regulation, Part 252 of the DOT's Economic Regulations, 14 CFR Ch. II §252. As you will see, the airlines are obliged to, and do provide, a sufficient number of seats in no-smoking sections, for each class of service, to accommodate all persons who wish to be seated there, as well as an expansion of no-smoking sections to meet passenger demand (§252.7). Passengers on our international flights routinely request seats in a smoking or non-smoking section according to their desires, and are accommodated. Cigars and pipes are prohibited on U.S. air carriers (§252.15), and our carriers have an obligation to take such action as is necessary to ensure that smoking by passengers or crew is not permitted in no-smoking sections or at other times or places where smoking is prohibited (§252.17).

Whether or not smoking parents choose to expose their children to second-hand smoke as they do in their more poorly ventilated homes and cars is a decision made by the individual parent. As was pointed out to Mr. Banzhaf, his basic desire is to have smoking banned. As we had pointed out in our direct testimony, the U.S. airline industry fully supports the efforts by the International Civil Aviation Organization to achieve a smoking ban that will lead to uniform worldwide guidelines and rules. In that

Honorable James L. Oberstar
Page Two
June 10, 1994

regard, in response to one of your questions, I cited a one-year exemption from the Canadian government's smoking ban, granted to Canadian Airlines International because 75 percent of the traffic on its Vancouver-Tokyo route was of Japanese origin, and 60 percent of those people wanted to smoke.

I trust that this letter offers the facts desired for the record.

Respectfully submitted,

Jim Landry

James E. Landry
President

cations. Some airlines do not apply these consumer protections to travel from some foreign countries, although other consumer protections may be available. Check with your airline or your travel agent.

(b) Every carrier shall include with each ticket sold in the United States the notices set forth in paragraph (a) of this section, printed in at least 12-point type. The notice may be printed on a separate piece of paper, on the ticket stock, or on the ticket envelope. The last two sentences of the notice shall be printed in a type face contrasting with that of the rest of the notice.

(c) It shall be the responsibility of each carrier to ensure that travel agents authorized to sell air transportation for that carrier comply with the notice provisions of paragraphs (a) and (b) of this section.

(d) [Reserved]

(e) Any air carrier or foreign air carrier engaged in foreign air transportation that complies fully with this part for inbound traffic to the United States need not use the last two sentences of the notices required by paragraph (a) of this subsection.

(Approved by the Office of Management and Budget under control number 3024-0018)

[ER-1308, 47 FR 52985, Nov. 24, 1982, as amended by ER-1392, 49 FR 40401, Oct. 16, 1984]

PART 252—SMOKING ABOARD AIRCRAFT

Sec.

AUTHORITY: Secs. 204, 404, 407 and 416 of Pub. L. 85-726 and 101-164, as amended, 72 Stat. 743, 760, 766, 771, 49 U.S.C. 1324, 1374, 1377, 1386.

SOURCE: 55 FR 4993, Feb. 13, 1990, unless otherwise noted.

CROSS REFERENCE: For smoking rules of the Federal Aviation Administration, see 14

CFR 121.317(c), 121.571(a)(1)(i), 129.29, 135.117(a)(1), and 135.127(a).

§ 252.1 Purpose.

This part implements a ban on smoking of tobacco on flight segments between most U.S. points as required by section 335 of Public Law 101-164. It also continues smoking restrictions on other flights. Nothing in this regulation shall be deemed to require U.S. or foreign air carriers to permit the smoking of tobacco aboard aircraft.

§ 252.3 Applicability.

Section 252.5 applies to scheduled-service flight segments operated by U.S. and foreign direct air carriers between the U.S. points specified in that section. The remainder of this part applies to all operations of U.S. direct air carriers, except on-demand services of air taxi operators.

§ 252.5 Smoking ban on U.S. segments.

U.S. and foreign direct air carriers shall prohibit smoking in the passenger cabin and lavatories on any nonstop flight segment that is listed in the current *Official Airline Guide*, or is part of a longer flight that is listed in that publication, and that is:

(a) Between any two points within an area composed of Puerto Rico, the U.S. Virgin Island, the District of Columbia, and the 48 contiguous states of the United States;

(b) Between any two points within the State of Alaska or within the State of Hawaii; or

(c) Scheduled in the current *Official Airline Guide* to be six hours or less in duration and that is:

(1) Between any point in paragraph (a) of this section and any point in Alaska or Hawaii; or

(2) Between any point in Alaska and any point in Hawaii.

§ 252.7 No-smoking sections.

(a) Except as provided in paragraph (b) of this section, U.S. air carriers operating nonstop flight segments to which §§ 252.5 and 252.13 do not apply shall provide, at a minimum:

(1) A no-smoking section for each class of service;

(2) A sufficient number of seats in each no-smoking section to accommodate all persons in that class of service who wish to be seated there;

(3) Expansion of no-smoking sections to meet passenger demand; and

(4) Special provisions to ensure that if a no-smoking section is placed between smoking sections, the nonsmoking passengers are not unreasonably burdened.

(b) On flights for which passengers may make confirmed reservations and on which seats are assigned before boarding, a U.S. air carrier need not provide a seat in a no-smoking section to a passenger who has not met the carrier's requirements as to time and method of obtaining a seat on the flight, or who does not have a confirmed reservation. If a seat is available in the established no-smoking section, however, a U.S. air carrier shall seat there any enplaning passenger who so requests, regardless of boarding time or reservation status.

§ 252.9 Ventilation systems.

U.S. air carriers shall prohibit smoking whenever the ventilation system is not fully functioning. Fully functioning for this purpose means operating so as to provide the level and quality of ventilation specified and designed by the manufacturer for the number of persons currently in the passenger compartment.

§ 252.11 Aircraft on the ground.

U.S. air carriers shall prohibit smoking whenever the aircraft is on the ground.

§ 252.13 Small aircraft.

U.S. air carriers shall prohibit smoking on aircraft designed to have a passenger capacity of less than 30 seats.

NOTE—This section, like the rest of this part, does not apply to on-demand services of air taxi operators; see § 252.3 in this part.

§ 252.15 Cigars and pipes.

U.S. air carriers shall prohibit the smoking of cigars and pipes aboard aircraft.

§ 252.17 Enforcement.

U.S. and foreign air carriers shall take such action as is necessary to ensure that smoking by passengers or

crew is not permitted in the passenger cabin or lavatories on no-smoking flight segments. U.S. air carriers shall take such action as is necessary to ensure that smoking by passengers or crew is not permitted in no-smoking sections or at other times or places where smoking is prohibited by this part, and to maintain required separation of passengers in smoking and no-smoking areas.

§ 252.19 Single-entity charters.

On single-entity charters operated pursuant to §§ 207.50 or 208.300 of this title, U.S. air carriers need not comply with the procedures of part 252 if such a request is made by the charterer, provided that each passenger on such flights is given notice of the smoking procedures for the flight at the time he or she first makes arrangements to take the flight.

PART 253—NOTICE OF TERMS OF CONTRACT OF CARRIAGE

AUTHORITY: Secs. 204, 403, 404, and 411, Pub. L. 85-726, as amended, 72 Stat. 743, 758, 760, 769; 49 U.S.C. 1324, 1373, 1374, 1381.

SOURCE: ER-1302, 47 FR 52134, Nov. 19, 1982, unless otherwise noted.

§ 253.1 Purpose.

The purpose of this rule is to set uniform disclosure requirements, which preempt any State requirements on the same subject, for terms incorporated by reference into contracts of carriage for scheduled service in interstate and overseas passenger air transportation.

§ 253.2 Applicability.

This rule applies to all scheduled direct air carrier operations in interstate and overseas air transportation. It applies to all contracts with passengers, for those operations, that incorporate terms by reference.

[ER-1323, 48 FR 6318, Feb. 11, 1983]

§ 253.3 Definitions.

Large aircraft means any aircraft designed to have a maximum passenger capacity of more than 60 seats.

Passenger means any person who purchases, or who contacts a ticket office or travel agent for the purpose of purchasing, or considering the purchase of, air transportation.

Ticket office means station, office, or other location where tickets are sold that is under the charge of a person employed exclusively by the carrier, or by it jointly with another person.

§ 253.4 Incorporation by reference in the contract of carriage.

(a) A ticket or other written instrument that embodies the contract of carriage may incorporate contract terms by reference (i.e., without stating their full text), and if it does so shall contain or be accompanied by notice to the passenger as required by this part. In addition to other remedies at law, an air carrier may not claim the benefit as against the passenger of, and the passenger shall not be bound by, any contract term incorporated by reference if notice of the term has not been provided to that passenger in accordance with this part.

(b) Each air carrier shall make the full text of each term that it incorporates by reference in a contract of carriage available for public inspection at each of its airport and city ticket offices.

(c) Each air carrier shall provide free of charge by mail or other delivery service to passengers, upon their request, a copy of the full text of its terms incorporated by reference in the contract. Each carrier shall keep available at all times, free of charge, at all locations where its tickets are sold within the United States information sufficient to enable passengers to order the full text of such terms.

(The notice requirements contained in paragraphs (b) and (c) were approved by the Office of Management and Budget under control number 3024-0061)

WASHINGTON EDITION · LOS ANGELES TIMES

Executive Travel

5-26-94

ON THE MOVE / CAROL SMITH

Flight Attendants Lobby for Cleaner Air

One of the perennial concerns of people who fly frequently has been the quality of the air they breathe in flight.

Fifteen years ago, most complaints centered on discomfort caused by dry air. Five years ago, the primary complaint was from breathing secondhand smoke, which led Congress in 1990 to ban smoking on all flights shorter than six hours.

Recently, however, concerns have focused on environmental hazards, ranging from air pollutants to the risk of getting a communicable illness.

In testimony before Congress last week, Federal Aviation Administration officials supported recent studies showing that cabin air is healthful to breathe. However, the Assn. of Flight Attendants, a 33,000 member union, continues to press Congress for legislation to set higher standards for fresh air in planes.

The union argues that fresh air contains fewer contaminants, including airborne viruses and bacteria, than does recirculated air. In addition, the group believes that by changing the air in the plane more frequently, the risk of disease-causing organisms or fumes being inhaled by passengers will be reduced.

Toward that end, Reps. Jerrold Nadler (D-N.Y.) and Peter A DeFazio (D-Ore.) have introduced a bill that would set a standard for the amount of fresh air reaching passengers and crew in the cabin, as well as establish a toll-free phone number for reporting air quality problems.

"There are currently no federal minimum standards for the amount of fresh air" in aircraft cabins, said Chris Witkowski, a spokesman for the Assn. of Flight Attendants. However, there are standards for the cockpit, where pilots are required to be alert at all times, he said.

The increased attention to air quality is due in part to a change in the way newer aircraft ventilate their cabins, said David Stempler, executive director of the International Airline Passengers Assn., a Washington-based group that represents 110,000 passengers. Aircraft built at least 15 years ago circulate 100% fresh air throughout the cabin, whereas newer ones use a combination of fresh and recycled cabin air.

This change, along with a reduction in the number of times the air in the cabin is replaced with fresh air, has raised concerns that the level of contaminants in aircraft air is higher than it was before.

The Assn. of Flight Attendants said anecdotal evidence of crew members' symptoms—such as dizziness, headaches, nausea and feelings of disorientation—has been increasing, although the union has not officially tracked the number of complaints.

Because of such complaints, the FAA and the airline industry have mounted several studies over the past five years to look at air quality on aircraft.

Most recently, for example, the Air Transport Assn., a Washington-based trade organization that represents airlines, released the results of its "Airline Cabin Air Quality Study." The study, conducted by independent testing agency Consolidated Safety Services Inc., sampled air on 35 flights of various lengths on eight major airlines.

Sampling took place on four types of aircraft, both newer and older models. The tests measured carbon dioxide, temperature, relative humidity, noise, volatile organic compounds and particulates. The company also took samples to identify bacterial and fungal contaminants.

Results showed that "levels of c[illegible]minants found in airline cabins are not likely to cause adverse health effects" and that "both generations of aircraft exceed the requirements for maintaining a healthy air quality environment."

In addition, the study found that levels of carbon dioxide, a by-product of breathing that can cause symptoms such as lethargy, dizziness and rapid heart rate at high concentrations, were lower than those found in other indoor settings, such as shopping malls or office buildings.

In his recent testimony before Congress, Jon Jordan, the federal air surgeon for the FAA, reviewed results of that study and two other reports—a 1989 study conducted for the FAA and the Department of Transportation and a 1991 study conducted by the National Institutes of Occupational Safety and Health. They also found that levels of airborne contaminants and other pollutants were beneath federal guidelines.

The FAA therefore believes that current ventilation systems maintain healthful air on planes, said Hank Verbais, a spokesman for the FAA's Western Pacific Region.

Still, the perception that the air in the enclosed space of an airliner contains unhealthful levels of particulates and other compounds remains. The Assn. of Flight Attendants believes it is a safety issue, because the safety of passengers depends on flight attendants functioning without impairment in an emergency. And the FAA continues to get calls from concerned passengers. The Airline Passengers Assn., however, said it is no longer a major issue for its members.

A more alarming issue for passengers who fly overseas is the practice at some international airports of using pesticides to decontaminate planes, Stempler said. Fear of introducing insects that could damage crops is the motivation, but the practice, which the Airline Passengers Assn. is currently investigating, has raised health concerns among its members.

CAROL SMITH *is a free-lance writer based in Pasadena*

Personal View

- **Name:** Charlotte Bernard
- **Position:** Art consultant, Santa Monica

On May 12, a reader described an experience with a lost ticket in a Personal View column. Here's another perspective.

I bought a discounted round-trip ticket to visit my sisters in Vermont and Connecticut. I did not discover until I was getting my baggage ready for the return flight from Vermont that I did not have my return ticket. I phoned my sister in Connecticut and she confirmed that the ticket was there. She read the numbers off to me and I subsequently called the airline and confirmed my flight. However, when we reached the terminal, they would not acknowledge that I had had a ticket, even though I gave them the ticket numbers. While I argued with them—they wanted me to purchase a full-fare, one-way return ticket—my other sister whispered in my ear, "Don't argue; write out a check and you can cancel it after you get home!" Which is exactly what I did. In the meantime, my sister in Connecticut mailed my ticket to me. I wrote a letter to the airline explaining why I canceled the check and enclosed my ticket. They, in turn, wrote me a very apologetic letter and said they were sorry for my inconvenience.

Do you have advice for fellow business travelers or a travel-related experience you would like to share? Please mail your typewritten contribution to Executive Travel, Los Angeles Times—Business News, Times Mirror Square, Los Angeles, CA 90053. Or fax it to (213) 237-7837. Or send it electronically to 3666973@mcimail.com on the Internet. Please be as detailed as possible and include your name, title, company and a daytime phone number.

American Medical Association
Physicians dedicated to the health of America

James S. Todd, MD
Executive Vice President

515 North State Street
Chicago, Illinois 60610

312 464-5000
312 464-4184 Fax

May 27, 1994

The Honorable James L. Oberstar
Chairman, Aviation Subcommittee
Committee on Public Works and Transportation
U.S. House of Representatives
2366 Rayburn House Office Building
Washington, DC 20515

RE: Statement for the May 18 Hearing Record

Dear Representative Oberstar:

The American Medical Association (AMA) is pleased to provide the attached statement regarding aircraft cabin air quality. We have always been greatly concerned about the aircraft cabin environment, with regard to its effect upon the health and safety of passengers and crew members aboard civil commercial aircraft. Just as we were a major proponent of the smoking ban on domestic commercial flights almost a decade ago, we today again are calling for an outright smoking ban on all flights, including lengthy international flights. We believe that it is time to take this step, because to continue to subject passengers and flight crew members to severe irritation from smoke and (even more important) to adverse health consequences from environmental tobacco smoke exposure on very lengthy international flights is wholly inappropriate. We appreciate your consideration of our attached statement.

Sincerely,

James S. Todd MD

James S. Todd, MD

cc: The Honorable William Clinger

STATEMENT

of the

AMERICAN MEDICAL ASSOCIATION

to the

AVIATION SUBCOMMITTEE

of the

HOUSE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

RE: Aircraft Cabin Air Quality

Statement for the May 18, 1994 Hearing Record

The American Medical Association (AMA) is pleased to submit this statement for the hearing record of the Aviation Subcommittee's May 18, 1994 hearing relating to airliner cabin air quality. We have always been greatly concerned about the aircraft cabin environment, with regard to its effect upon the health and safety of passengers and crew members aboard civil commercial aircraft.

The AMA is most pleased to see the vast improvement in aircraft cabin air quality which has taken place on domestic commercial flights during the past 6 years. This improvement is due in very large part to the ban on smoking on all domestic commercial flights which has been in effect since 1988.

The AMA was a major proponent of the smoking ban on domestic commercial flights. In the mid-1980's, we endorsed the recommendation regarding smoking aboard aircraft of the

National Academy of Science "Airline Cabin Air Quality Study," which found environmental tobacco smoke (ETS) to be a hazardous substance in the aircraft cabin environment. We strongly called for legislation to eliminate smoking aboard aircraft. The enactment of such legislation has been highly beneficial.

Just as passengers and flight crews should not be subjected to the adverse health consequences of ETS (not to mention the irritation and discomfort caused by smoke) aboard domestic commercial flights, even more so should they not be subjected to such irritation and health hazards on international flights. A great deal of evidence has been set forth in recent years indicating the dangerous health effects of ETS. The Environmental Protection Agency in January 1993 issued its report, "Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders." We concur strongly with the findings of this report, which clearly pointed out the dangers inherent in exposure to ETS.

On flights permitting smoking, tobacco smoke always was the most frequent source of complaints about aircraft air quality. The aircraft cabin environment has the potential to make matters of irritation from smoke and adverse health consequences from ETS exposure worse through abnormally low relative humidity and ventilation.

We have special concern for passengers with pulmonary or cardiovascular disease and for flight crew members who continue to fly while pregnant. Passive exposure to tobacco smoke

has been found to affect a baby's birth weight. In addition, every passenger and crew member is at mortal risk in an aircraft fire ignited by smoking materials.

The advantages of eliminating smoking from aircraft were found in 1986 by the National Academy of Science to be:

- less irritation to passengers and crew;
- reduced potential health hazards to crew;
- elimination of the possibility of cigarette-caused fires; and
- bringing cabin air quality into line with established standards for other closed environments.

These same advantages of eliminating smoking exists today with regard to international airline flights.

To continue to subject passengers and crew members to severe irritation from smoke and adverse health consequences from ETS exposure on very lengthy international flights is wholly inappropriate. Just as wisdom and the interests of health and safety prevailed in this country in protecting all passengers and crew aboard civil commercial aircraft through enactment of the smoking ban on all domestic commercial flights, so too we feel should such a ban be extended to international flights, which are even lengthier and potentially more dangerous to the health of passengers and crew members. On the basis of public health, passengers and crew on long international flights certainly have just as much right and need to breathe clean air as passengers and crew on domestic flights.

In a September 18, 1992 letter to then-Secretary of Transportation Andrew Card (letter attached), the AMA called for the U.S. representative to the International Civil Aviation Organization Assembly to support a resolution to ban smoking on international air flights. Citing both the health and safety of passengers and crews alike, we urged support for the resolution to require that all international flights become smoke-free by July 1, 1994.

While the July 1, 1994 date will obviously not be met, we continue to urge a ban on smoking on all international airline flights, and we urge this Subcommittee to take any actions it may deem appropriate to strive to effect this goal.

American Medical Association

Physicians dedicated to the health of America

James S. Todd, MD
Executive Vice President

515 North State Street
Chicago, Illinois 60610

312 464-5000
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RECEIVED
SEP 22 1992
LEE J. STILLWELL
SENIOR VICE PRESIDENT

September 18, 1992

The Honorable Andrew H. Card
Secretary
Department of Transportation
400 7th Street, SW
Washington, D.C. 20590

RE: Tobacco Smoke on International Air Flights

Dear Secretary Card:

On September 22, 1992, the International Civil Aviation Organization (ICAO) Assembly will begin its fall plenary session in Montreal, Canada. On the agenda is a resolution from the representatives of Canada and Australia that will request the Assembly to seek development of a standard regarding smoking on international air flights, requiring that all international flights become smokefree by July 1, 1994.

The American Medical Association strongly urges your support for the resolution to be introduced by the Canadian and Australian ICAO representatives. We urge you to instruct the United States representative to the Assembly, Mr. D.M. Newman, to actively favor the resolution.

The health effects of environmental tobacco smoke (ETS) are now well known. The U.S. Environmental Protection Agency, the U.S. Surgeon General, and the National Institute of Occupational Safety and Health have all recognized that exposure to the over 4000 chemical toxins in tobacco smoke can lead to carcinogenic conditions. In addition, exposure to ETS is a cause of heart disease, asthma, and can initiate migraine headaches and impair night vision. These last two conditions not only affect passenger health, but crew performance and safety as well. There is no minimum level of exposure to ETS that can be considered an acceptable health risk.

Safety, too, is at stake. The solid particulates or "tar" in tobacco smoke accumulate in cabins and can affect the operation of equipment on commercial aircraft, including electronic equipment, air outflow valves, and oxygen mask doors. Tar accumulations can add up to 200 pounds of weight each year, adding to fuel costs and making operations inefficient.

It is not possible to meaningfully separate the intertwined issues of health and safety as they relate to commercial aviation. The AMA, the World Health Organization, the World Medical Association, and many other health and medical authorities believe that a worldwide ban on smoking on

Page 2
September 18, 1992
The Honorable Andrew H. Card

flights should be imposed. The experience in the United States with our domestic law has been overwhelmingly popular, easy to enforce, and welcomed by flight crews.

In summary, the United States delegation to the ICAO Assembly should support a universal ban on smoking on all international passenger flights, as introduced by the Canadian and Australian representatives. Your active support will help protect the health and safety of passengers and crews alike.

Sincerely,

James S. Todd

James S. Todd, M.D.

JST/kw

COLUMBUS HEATING AND VENTILATING COMPANY

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MAY 16, 1994

HEALTHY AIR: AIRPLANE AIR PURIFICATION SYSTEM

I AM RAYMOND A. MEISTER, P.E., VICE PRESIDENT OF ENGINEERING AND THE INDUSTRIAL DIVISION FOR COLUMBUS HEATING & VENTILATING COMPANY OF COLUMBUS, OHIO. I AM HERE TO DISCUSS A PATENTED INDOOR AIR PURIFICATION SYSTEM THAT CAN SOLVE THE PROBLEM OF POOR, AND OFTEN HEALTH-ENDANGERING, AIR QUALITY IN AIRLINE CABINS.

THE SYSTEM IS CALLED THE HEALTHY LIFE INDOOR AIR PURIFICATION SYSTEM. AND IT CAN PROVIDE AIRLINES WITH CABIN AIR THAT IS AS "CLEAN AS THE AIR IN HOSPITAL OPERATING ROOMS." IT IS THE MOST COMPLETE AND COMPREHENSIVE INSIDE AIR FILTRATION SYSTEM POSSIBLE IN THE WORLD TODAY UNDER CURRENTLY AVAILABLE TECHNOLOGY.

THE HEALTHY LIFE SYSTEM WILL KEEP AIRLINE CABINS VIRTUALLY FREE OF HARMFUL PARTICULATES, INCLUDING BACTERIA, DUST, MOLD SPORES, FUNGI AND VIRUSES AS SMALL AS 0.12 MIRCONS, AND SMALLER, AND IT REMOVES POTENTIALLY DANGEROUS VOLATILE ORGANIC COMPOUNDS GIVEN OFF BY SMOG GASES, PLASTICS AND SEAT COVER MATERIALS AND OTHER SOURCES.

THE SYSTEM INCLUDES A SERIES OF "STATE-OF-THE-ART" AIR FILTERS STAGED WITH A BLOWER UNIT OR A SERIES OF BLOWER UNITS TO PURIFY THE AIR AS IT IS DIRECTED THROUGH THE UNIT AND IN TURN IS CIRCULATED THROUGH THE AIRCRAFT'S EXISTING HEATING, VENTILATING AND AIR CONDITIONING SYSTEM.

MILLIONS OF AIR PASSENGERS SUFFER FROM RESPIRATORY AND CIRCULATORY DISEASES THAT CAN BE AGGRAVATED BY EXPOSURE TO POLLUTED INSIDE AIR SUCH AS PASSENGERS EXPERIENCE WITHIN THE CONFINES OF AN AIRLINER CABIN. WITH THE CONCENTRATION OF PEOPLE INSIDE AIRPLANES TODAY, CLEAN, POLLUTION-FREE AIR CAN MINIMIZE THE TRANSMISSION OF ILLNESS IN KEEPING BACTERIA AND VIRUSES FROM ONE PERSON TO ANOTHER.

SINCE SMOKING IS NO LONGER ALLOWED ON MOST DOMESTIC FLIGHTS, ONE OF THE AIR QUALITY PROBLEMS FOR AIRLINE PASSENGERS HAS BEEN BROUGHT UNDER CONTROL. BUT, THERE IS JUST AS GREAT A HEALTH DANGER FROM INVISIBLE CONTAMINANTS WHICH FLOAT AROUND IN CABIN AIR THAT SHOULD BE SUBJECTED TO GREATER CONTROL.

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THE HEALTHY LIFE SYSTEM IS THE ONLY PATENTED SYSTEM THAT CAN REMOVE UP TO 99.00% OF PARTICULATE AND UP TO 99.5% OF THE PREVIOUSLY MENTIONED GASEOUS POLLUTANTS.

THE DESIGN OF THIS SYSTEM IS BASED UPON A PATENT THAT PROVIDES FOR A HEALTHY, CONTROLLED CLEAN AIR ENVIRONMENT FOR ENCLOSED SPACES. THE SAME SYSTEM CAN BE DESIGNED ON A LARGER SCALE FOR HOMES, CONDOMINIUMS, HOSPITALS, OFFICE BUILDINGS, NURSING HOMES, OR ANY OTHER TYPE OF BUILDING, AND FOR THE USE IN AUTOMOBILES.

THE SYSTEM HAS BEEN FULLY TESTED FOR EFFECTIVENESS BY HEALTHY BUILDING INTERNATIONAL (HBI) OF FAIRFAX, VIRGINIA, ONE OF THE WORLD'S LEADING INDOOR AIR QUALITY TESTING FIRMS. HBI's REPORT STATED THAT THE SYSTEM'S EFFICIENCY FOR PARTICULATE, GAS AND ODOR REMOVAL "EXCEEDS ALL RECOMMENDED STANDARDS FOR MOST OCCUPIED AREAS" AND "MATCHES STANDARDS TYPICALLY RESERVED FOR HOSPITAL OPERATING ROOMS AND INTENSIVE CARE AREAS."

THE HEALTHY AIR SYSTEM WAS DEVELOPED WITH THE ADVICE AND COUNSEL OF SEVERAL PROMINENT PHYSICIANS WHO HAVE BEEN GENEROUS IN THEIR PRAISE OF WHAT THE SYSTEM CAN DO FOR PEOPLE WHO SUFFER FROM ASTHMA, EMPHYSEMA, AND OTHER RESPIRATORY CONDITIONS, AND EVEN FOR HEART PATIENTS WHO CAN BREATHE EASIER IN POLLUTION-FREE INDOOR AIR.

I CAN SAY UNEQUIVOCALLY THAT IF YOU WANT THE CLEANEST, MOST POLLUTION-FREE CABIN AIR IN COMMERCIAL AIRLINES, THIS IS THE SYSTEM THAT CAN PROVIDE SUCH FOR THE BENEFIT OF AIRLINE PASSINGERS.

ALLOW ME TO TAKE JUST A FEW MINUTES TO DESCRIBE THE BASIC SYSTEM AND THE EQUIPMENT CONTAINED IN THIS "HEALTHY LIFE: AIR PURIFICATION SYSTEM".

THE FIRST OPERATION THAT IS PERFORMED IS TO ROUTE ALL OF THE RETURN AIR FROM THE AIRPLANE THAT WOULD NORMALLY BE DRIVEN THROUGH THE PLANE'S HEATING AND AIR CONDITIONING SYSTEM AND RE-DIRECT THIS AIR TO THE INTAKE END OF OUR "HEALTHY LIFE AIR PURIFICATION SYSTEM". IN ADDITION TO THIS OPERATION, OUTSIDE AIR IS ALSO BROUGHT INTO THE UNIT. NOW WHAT IS ACCOMPLISHED HERE IS THAT THE UNIT TAKES BOTH THE AIRPLANE'S RETURN AIR AND ALSO TAKES THE FRESH OUTSIDE AIR AND COMBINES THE TWO (2) OR MIXES THE TWO (2) TYPES OF AIR IN THE UNIT'S MIXING BOX. THE "HEALTHY LIFE AIR PURIFICATION SYSTEM", AS A SYSTEM, CONTROLS OR MONITORS THE AMOUNT OF BOTH THE PLANE'S RETURN AIR AND ALSO THE OUTSIDE AIR INTO THE UNIT BY A UNIQUE AIR CONTROL SYSTEM WHICH MAINTAINS A POSITIVE (+) AIR PRESSURE TYPE CONDITION WITHIN THE AIR PLANE AT ALL TIMES. IN THIS WAY THE "HEALTHY LIFE AIR PURIFICATION SYSTEM" IS PRESSURIZING THE AIRPLANE WHICH PREVENTS OR HINDERS ANY UNWANTED GASES AND POLLUTANTS FROM ENTERING THE PLANE FROM THE OUTSIDE, THUS MAINTAINING A CLEAN, POLLUTANT FREE PURIFIED AIR TYPE ATMOSPHERE WITHIN THE AIRPLANE.

FROM THE MIXING BOX'S COMBINATION OF RETURN AIR AND OUTSIDE AIR, THE MIXED AIR IS NOW FORCED THROUGH THE FIRST OF SEVEN FILTERING SYSTEMS WITHIN THE UNIT. (<u>STAGE</u> <u>No. 1</u>) THIS IS A PRE-FILTER DESIGNED TO REMOVE APPROXIMATELY THIRTY PERCENT (30%) OF ALL THE AIR-BORNE PARTICULATE ONE (1) MICRON AND LARGER.

THE CLEANER AIR IS NOW FORCED THROUGH THE UNIT'S SECOND FILTERING SYSTEM. (<u>STAGE</u> <u>No. 2</u>) THIS IS A CARTRIDGE TYPE FILTER SYSTEM DESIGNED TO REMOVE NINETY-FIVE PERCENT (95%) OF ALL PARTICULATE AT ONE-HALF MICRON IN SIZE AND LARGER.

THE AIR IS NOW ROUTED THROUGH THE UNIT'S THIRD FILTERING SYSTEM (<u>STAGE</u> <u>No. 3</u>) THIS IS A SPECIAL HEPA FILTER SYSTEM. THIS HEPA FILTER SYSTEM IS A "HIGH EFFICIENCY PARTICULATE AIR FILTRATION" MEDIA WHICH PROVIDES FOR THE HIGHEST DEGREE OF PARTICULATE CLEANLINESS BY REMOVING NINETY-NINE POINT NINE-NINE PERCENT (99.99%) OF ALL PARTICULATE SIZED AT 0.12 MICRON AND LARGER. IN OTHER WORDS, THE AIR IS NOW PRACTICALLY FREE OF ALL AIR-BORNE OR FLOATING MATTER AFTER BEING DISCHARGED FROM THIS HEPA FILTER.

FROM THIS POINT THE AIR IS ROUTED THROUGH A BOOSTER BLOWER OR OTHERWISE NOTED AS AN AUXILIARY FAN UNIT. THIS BLOWER ALLOWS THE "HEALTHY LIFE AIR PURIFICATION SYSTEM" TO MAINTAIN ENOUGH POWER OR STRENGTH TO FORCE THE AIR THROUGH THE REMAINING FOUR (4) FILTERING SYSTEMS, OR THE REMAINING FOUR (4) STAGES DESIGNED AND

ENGINEERED TO SPECIFICALLY REMOVE, ABSORB AND/OR OXIDIZE GASES AND ODORS AND ADDITIONAL PARTICULATE OUT OF THE AIR FLOW STREAM.

THE UNIT'S FOURTH FILTERING SYSTEM (<u>STAGE</u> <u>No. 4</u>) IS AN ACTIVATED CHARCOAL TYPE MEDIA. IT IS THIS SYSTEM WHICH LITERALLY ADSORBS COOKING AND FOOD ODORS, PET ODORS, BODY ODORS, PRINTING AND COPYING ODORS, SMOKE, CLEANING SOLUTION FUMES, DIAPER PAIL AROMAS AND OTHER UNDESIRABLE FUMES AND GASES.

THE UNIT'S FIFTH FILTERING SYSTEM (<u>STAGE</u> <u>No. 5</u>) IS DESIGNED TO OXIDIZE THE REMAINING FUMES AND OTHER SUCH GASEOUS METHANOLS, PHENOLS, SULFUR DIOXIDES, ETHANOLS, TETRACHLORIDES AND MANY OTHER TYPES OF HARMFUL GASES. THE AIR STREAM BEING FORCED THROUGH THE UNIT IS NOW NINETY-NINE POINT FIVE PERCENT (99.5%) FREE FROM GASES AND ODORS.

THE UNIT'S SIXTH FILTERING SYSTEM (<u>STAGE</u> <u>No. 6</u>) HAS ANOTHER CARTRIDGE TYPE FILTER SYSTEM USED TO CAPTURE ANY AND ALL POSSIBLE ACTIVATED CHARCOAL AND POTASSIUM PERMANGANATE MEDIA THAT MAY HAVE WORKED ITS WAY THROUGH THE ODOR AND GAS ADSORPTION FILTRATION SYSTEM ITSELF.

THE UNIT'S SEVENTH AND FINAL FILTERING SYSTEM (<u>STAGE</u> <u>No. 7</u>) HAS AN ADDITIONAL SPECIAL HEPA FILTER SYSTEM USED TO REMOVE ALL PARTICULATE AND BACTERIA @ 99.9999% HAVING A SIZE OF 0.02 MICRON AND LARGER, AND A GOOD NUMBER OF PARTICULATE WELL BELOW THE 0.02 MICRON SIZE.

THIS HEALTHY LIFE AIR PURIFICATION SYSTEM INCLUDES A MICRO-PROCESSOR CONTROLLER WHICH PERFORMS A NUMBER OF SYSTEM CHECK-OUT AND COMMAND FUNCTIONS. FIRST, IT MONITORS AND CONTROLS THE FRESH AIR INTAKE DAMPER TO PROVIDE THE NECESSARY OUTSIDE AIR INTO THE MIXING BOX AT ALL TIMES. SECOND, IT MONITORS A BLOWER VOLUME CONTROL DEVICE (VORTEX CONTROL DAMPER/VARIABLE MOTOR SPEED CONTROLLER) TO MAINTAIN THE CONSTANT AIR PRESSURE WITHIN THE AIR PLANE. THIRD, IT MONITORS THE OUTDOOR AIR TEMPERATURE TO ALLOW FOR FREE COOLING (AIR CONDITIONING) AS NEEDED DURING THE MILD TO COOL TEMPERATURES. <u>THIS IS A REAL ENERGY SAVER.</u> IN TERMS OF FUEL AND ENGINE THRUST. FOURTH, IT REGULATES THE IN-PLANE'S RELATIVE HUMIDITY AND CONTROLS THE HUMIDIFICATION SYSTEM TO MAINTAIN A CONSISTENT COMFORTABLE CONDITION. LAST, BUT NOT LEAST, IT HAS AN AUTOMATED "DDC" (DIRECT DIGITAL/MICROPROCESSOR) DIAL-OUT THAT IS DIRECTED TO THE HEALTHY LIFE AIR PURIFICATION SYSTEM'S MAIN CONTROLLER FOR CRITICAL ALARM TYPE CONDITIONS; INCLUDING: BLOWER FAILURE, LOSS OF IN-PLANE (SYSTEM) PRESSURE, DIRTY FILTERS THAT REQUIRE REPLACEMENT, AND IN-PLANE AND UNIT TEMPERATURES THAT ARE OUT OF NORMAL RANGE PARAMETERS. THROUGH THIS MICRO-PROCESSOR CONTROLLER, THIS SYSTEM AND ITS EQUIPMENT IS MONITORED AND CONTROLLED AT ALL TIMES. ANY MALFUNCTION IS IMMEDIATELY SIGNALED AND ALARMED FOR CHECK-OUT AND SERVICE.

IT CAN BE SAID THAT AFTER THE AIR HAS BEEN CLEANED AND PURIFIED, BY FORCING THIS AIR THROUGH ALL SEVEN (7) STAGES OF FILTRATION THAT THIS UNIT PROVIDES, YOU NOW HAVE A VIRTUALLY POLLUTANT FREE, CLEAN AIR CONDITION THAT PROVIDES FOR A LONGER, HEALTHIER, MORE ACTIVE, LIFE STYLE.

AS AN PROFESSIONAL ENGINEER, I AM TRULY FASCINATED BY THE POTENTIAL THAT EXISTS FOR THE AIRPLANE ITSELF, THE COMMERCIAL AIR LINE INDUSTRY, THE AUTOMOBILE, HOMES, OFFICES, AND ANY OTHER ENCLOSED SPECIALIZED AND BUILDING STRUCTURE REQUIRING GOOD, CLEAN, PURIFIED AIR IN THIS RAPIDLY GROWING INDOOR AIR QUALITY (IAQ) INDUSTRY.

INDOOR AIR QUALITY IS ASSUMING AN INCREASED LEVEL OF IMPORTANCE IN THE AIR PLANE INDUSTRY, AUTOMOBILE, SPECIALIZED CONSTRUCTION, BUILDING CONSTRUCTION AND MAINTENANCE BUSINESS, ETC. BECAUSE OF THE DEMAND FOR HEALTHIER AND MORE COMFORTABLE INDOOR AIR IN THE AIRPLANES, AUTOMOBILES, BUSES, HOMES, OFFICE BUILDINGS, SCHOOLS, HOTELS, AND OTHER SUCH PUBLIC AND PRIVATELY OWNED SPECIALIZED STRUCTURES, BUILDINGS AND FACILITIES.

WITH THE COOPERATION OF THE UNITED STATES CONGRESS AND THE AIRLINES, THE UNITED STATES CAN HAVE THE CLEANLIST AIR IN ANY OF IT'S AIRLINES THAT IS, IN FACT, CLEANER THAN THE AIR FLOWING THROUGH A HOSPITAL OPERATING ROOM

COLUMBUS HEATING & VENTILATING COMPANY, WHICH HAS BEEN IN THE INDOOR AIR BUSINESS SINCE 1874, IS THE ONLY COMPANY IN AMERICA ENGAGED IN THE DESIGN, FABRICATION AND THE INSTALLATION OF THIS

SYSTEM. WE WILL BE HAPPY TO ENTERTAIN A VISIT TO COLUMBUS, OHIO, BY CONGRESSIONAL OR OTHER GOVERNMENT REPRESENTATIVES WHO WANT TO SEE THE SYSTEM IN OPERATION AND EXPERIENCE THE PRISTINE INDOOR AIR QUALILTY PROVIDED BY THE HEALTHY AIR SYSTEM.

THANK YOU,

RAYMOND A. MEISTER, P.E.

FILE No. E:\JOBS\6000\D084\E:PRESENTA.T07

HEALTHY LIFE™ INDOOR AIR PURIFICATION SYSTEM.

System can helo relieve or orevent:

1. Colds
2. Bronchitis
3. Asthmatic Bronchitis
4. Chronic Bronchitis
5. Emphysema
6. Extrinsic Asthma
7. Tuberculosis
8. Rhinitis
9. Allergic Rhinitis (Hay Fever)
10. Other allergies causea by airborne allergens
11. Staohlococci infections
12. Streptococci infections
13. Fatigue
14. Lassitude
15. Headaches
16. Sinusitis
17. Chemical sensitivities
18. Burning/itching eyes
19. Cardiopulmonary disease effects

System oressurizes the indoor air to minimize the infiltration of:

1. Radon
2. Other outdoor air oollutants, such as smog gases and vehicle exnaust gases.

System removes uo to 99.99% of airborne oarticulates 0.12 microns and laraer, includina:

1. Viruses
2. Bacteria
3. Pollen
4. Lung damaging dust
5. Mold
6. Fungi
7. Yeast cells
8. Animal dander
9. Tobacco smoke contaminants
10. Plant spores
11. Dust mite feces
12. Tars
13. Smoke in general
14. Mildew
15. Resins
16. Creosote

System also removes up to 99.5% of gaseous contaminants and fumes, including:

1. Ozone
2. Sulphur Dioxide
3. Nitrogen Oxides
4. Formaldehyde
5. Volatile organic chemical gases emitted by carpets, other household furnishing materials,
6. Odors, including cooking odors, paint odors, combustion odors, chemical odors and sewer odors.
7. Benzene
8. Nathalene
9. Kerosene
10. Menthols
11. Nicotine
12. Capylic Acid
13. Decane
14. Octylene
15. Turpentine
16. Tolvene
17. Vinylchorides
18. Freons
19. Dicloroethylene
20. Nitro benzene
21. Trichloroethlyene
22. Varnish
23. Ether
24. Tetrachloroethylene
25. Formic acid
26. Camphor
27. Butyraldehyde
28. Anesthetics
29. Methylchloroform
30. Naptha
31. Methol bromide
32. Propyl mercaptan
33. Carbon tetrachloride
34. Phenols
35. Methyl formate
36. Various other chemical fumes

United States Patent [19]

Rhodes

[11] **Patent Number:** 5,042,997

[45] **Date of Patent:** Aug. 27, 1991

[54] AIR CONTROL SYSTEM PROVIDING HEALTHFUL ENCLOSED ENVIRONMENT

[76] Inventor: **James A. Rhodes**, 42 East Gay St., Suite 1300, Columbus, Ohio 43215

[21] Appl. No.: **585,513**

[22] Filed: **Sep. 20, 1990**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 558,515, Jul. 27, 1990, abandoned.

[51] **Int. Cl.**[5] B03C 3/01; B01D 53/04; B01D 46/00

[52] **U.S. Cl.** .... 55/126; 55/213; 55/217; 55/316; 55/385.2; 98/1.5; 236/44 C

[58] **Field of Search** .... 55/20, 126, 21, 213, 55/215, 217, 316, 487, 385.2, 98/1.5; 236/44 C

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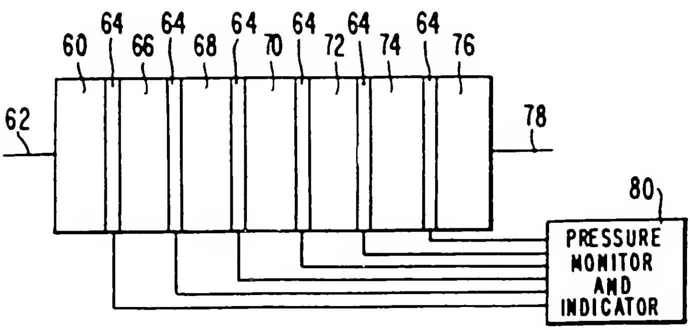
Primary Examiner—Charles Hart
Attorney, Agent, or Firm—Antonelli, Terry, Stout & Kraus

[57] **ABSTRACT**

An environmental control system providing a healthful environment in an enclosed structure for people living, working, travelling, or spending leisure time in the structure. The environmental control system may include a heating, ventilating and air conditioning unit, for controlling the temperature and humidity of air within the structure and pressurizing the interior of the structure, and an air cleaning system. The air cleaning system preferably includes a pre-filter unit to remove larger particulates, a medium efficient extended surface type filter device for capturing smaller particulates, a chemical and/or activated carbon filter device to provide gas phase air purification and scrubbing, and a high efficient particulate air filter device. If desired, an electronic air filter device can be included. An air quality measuring unit monitors the cleanliness of the air passing from the system. Pressure measuring devices may be installed across each filter unit so that the need to clean or replace a particular filter unit can be determined from a higher than normal pressure drop across the unit.

20 Claims, 2 Drawing Sheets



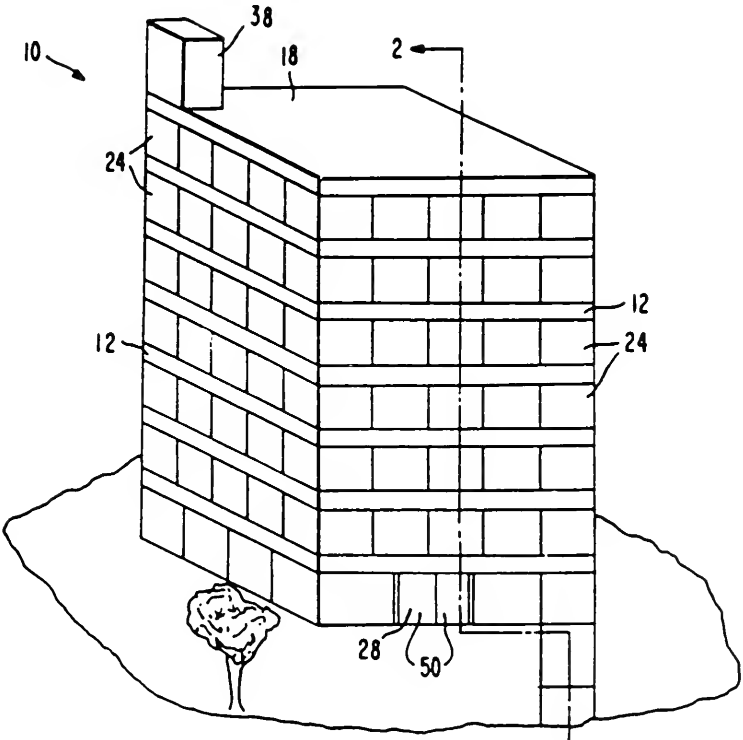

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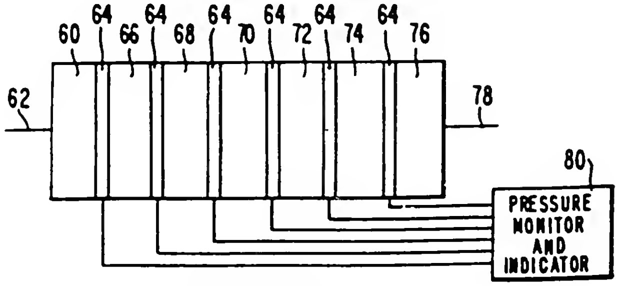
FIG. 1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PRESSURE MONITOR AND INDICATOR

FIG. 4

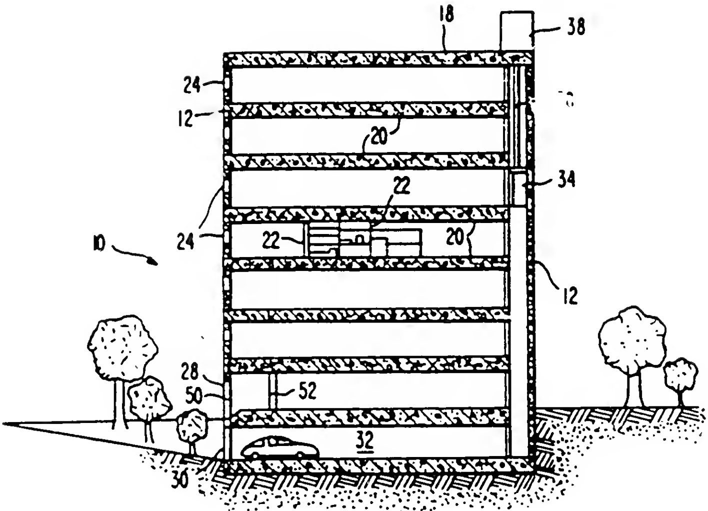

FIG. 2

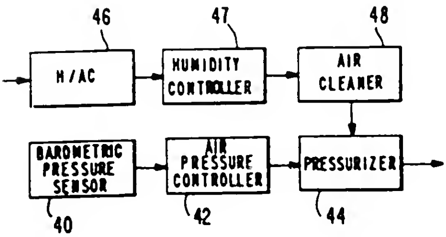

FIG. 3

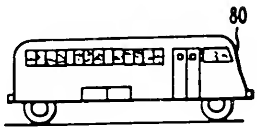

FIG. 5

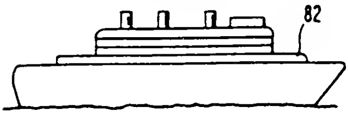

FIG. 6

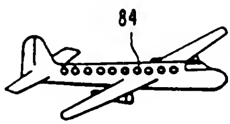

FIG. 7

AIR CONTROL SYSTEM PROVIDING HEALTHFUL ENCLOSED ENVIRONMENT

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of U.S. Pat. application Ser. No. 07/558,515, filed July 27, 1990 and now abandoned.

BACKGROUND OF THE INVENTION

The present invention pertains to an environmental control system to provide a healthful enclosed environment for people living, working, travelling, or otherwise spending time in an enclosed structure. The environmental control system enables people to avoid temperature extremes, undesirable humidity levels, polluted air, sudden variations in barometric pressure, and other conditions which are detrimental to the health and well being of the inhabitants.

Many people desire or require a healthful, controlled environment in which to live, work, travel, and engage in leisure activities. This is particularly true of older people and of people having health problems such as allergies, respiratory problems, circulatory problems, arthritis, or rheumatism. As recognized in, for example, *The Columbia University College of Physicians and Surgeons Complete Home Medical Guide*, Donald F. Tapley, M.D., editor, 1988, indoor air pollutants include ozone, carbon oxides, nitrous oxide, formaldehyde, and aerosol propellants, all of which have been found to cause health problems. The problems many people experience from allergies are well known. The "Cover Story" titled "Now's a very hopeful time for sufferers" found at page 1A of the May 9, 1990 *USA Today* describes such problems and the efforts made to avoid or overcome them.

It is a common practice to control the temperature and humidity of the air within an enclosed structure and to provide a mechanical or an electronic filter to remove pollen and particulates from the air. However, other impurities also are frequently found in the air. By way of example, as reported in "Indoor Ozone Exposures," by Charles J. Weschler, Helen C. Shields, and Datta V. Noik, *The Journal of the Air & Waste Management Association*, volume 39, No. 12, Dec. 1989, pages 1562-1568, studies have found that for many people indoor ozone exposure (i.e. concentration times duration of exposure) is greater than outdoor ozone exposure Undesirable levels of nitrogen oxides are also sometimes encountered inside buildings and other enclosed structures. Thus, it is desirable to reduce or control these and other forms of pollution from the air. Further, such humidity control has generally not provided optimum humidity levels for extended periods of time over varying temperatures. Medical experience indicates, for example, that a majority of the persons suffering from arthritis have less discomfort if they are able to remain fo. extended periods of time in an atmosphere with a humidity level in the range of from about 35% to about 55%.

SUMMARY OF THE INVENTION

The present invention is an environmental control system suitable for incorporation into any of various structures. As one example, the environmental control system of the present invention can be incorporated into a building having any of numerous uses, including use as a commercial building, an office buildin[illegible] esidential building, either a single family re[illegible] an apartment building. The building has a set [illegible] walls and a roof forming the outer building p[illegible] and defining the building exterior and interio[illegible] outer walls have at least one access opening to pe[illegible] rsonnel to enter and leave the building. The in[illegible] a[illegible] provided with interior walls and/or one o[illegible] floors so that the building comprises a multi-unit [illegible] or multi-storey building. As another example, the [illegible] onmental control system can be incorporated [illegible] vehicle such as an ocean liner, a bus, a railway p[illegible] er car, a car or truck.

The environmental control system as[illegible] healthful enclosed environment. The environme[illegible] ntrol system preferably includes a heating, ve[illegible] g, and air conditioning unit capable of contro[illegible] temperature and humidity within the encl[illegible] cture and capable of pressurizing the interio[illegible] enclosed structure, and an air cleaning syster[illegible] ir cleaning system comprises an air supply fan, r[illegible] ng devices, and various types of filters to trap, a[illegible] absorb and attach pollutants from the air stream. [illegible] e air cleaning system has the capability of cleaning in the order of about 99.9% of particles as small as 0.12 micron from the air, including dust, bacteria, mold, pollen, plant spores, lung damaging particles, yeast cells and many viruses. It also controls noxious gases such as nitrogen oxides, oxidants including ozone, sulfur dioxide, and chemical fumes such as formaldehyde.

The air cleaning system includes a fan with sufficient capacity to force air through the filter units and to overcome the static pressures created by the filter units. A pre-filter unit is included to remove larger particulates, which comprise a substantial portion of the contaminants. Generally, the pre-filter is formed of a fibrous material in the form of a pad which, when it has collected its dust load, can be discarded and replaced. A suitable pre-filter unit is available from American Air Filter Company.

A medium efficient (50%-90%) filter media device is included and preferably is of the extended surface type so that the air comes in as much contact with the media as possible. Various types of dust absorbing material can be used. A suitable filter device of this type is available from Farr Company. A chemical and/or activated carbon filter device is provided downstream of the medium efficient filter media device. This filter device utilizes a chemisorbant filter medium. As air is passed through this filter device, a combination of gas phase air purification and scrubbing adsorbs and/or absorbs impurities and improves the air quality. A suitable ch[illegible] ical/activated carbon filter device is available fro[illegible] fil Inc.

To capture microscopic particles as s[illegible] s 0.12 micron from the air stream, a high efficiency [illegible] culate air (HEPA) filter device is installed downstre[illegible] of the chemical/activated carbon filter device. T[illegible] EPA filter device is made in an extended surface are[illegible] nfiguration of deep space folds of submicron gla[illegible] ber paper. A suitable HEPA filter device is availab[illegible] om Cambridge Filter Company.

An electronic air filter device may be inclu[illegible] if desired. By using electrostatic precipitation, thi[illegible] ter device removes microscopic particulates. The [illegible] ectronic filter device consists of an ionization sectio[illegible] and a collecting plate section. Frequent cleaning of the electronic filter device is desirable and is accomplished

either by removing the cells or by means of a self-contained washing system.

An air quality measuring unit monitors the cleanliness of the air passing from the system, for example photoelectrically. To maintain the highest efficiency possible with the filtering system, pressure drop measuring devices are installed across each type of filter device so that the need to clean and/or replace components of a particular filter device can be determined from a higher than normal pressure drop across the unit.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects and advantages of the present invention are more apparent in the following detailed description and claims, particularly when considered in conjunction with the accompanying drawings in which like parts bear like reference numerals. In the drawings:

FIG. 1 is a perspective view of a building incorporating an environmental control system in accordance with the present invention;

FIG. 2 is a sectional view of the building, taken along line 2—2 of FIG. 1;

FIG. 3 is a block diagram of a preferred embodiment of an environmental control system in accordance with the present invention;

FIG. 4 is a block diagram of an air cleaning system suitable for use within the environmental control system of FIG. 3 in accordance with the present invention;

FIG. 5 is a perspective view of a motor vehicle incorporating an environmental control system in accordance with the present invention;

FIG. 6 is a perspective view of an ocean liner incorporating an environmental control system in accordance with the present invention; and

FIG. 7 is a perspective view of an airplane incorporating an environmental control system in accordance with the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

FIG. 1 depicts a building 10 incorporating an environmental control system in accordance with the present invention. By way of examples, building 10 might be an apartment building, a commercial building, or a professional or office building. As seen in FIGS. 1 and 2, building 10 includes a set of outer walls 12 forming the outer building perimeter and defining the building exterior. A substantially rigid roof 18, which can be of conventional design, is supported by outer walls 12 and, in cooperation with the outer walls, defines the building interior. A number of floors 20 can be positioned at different vertical levels within the interior of building 10. As illustrated by the fourth floor of building 10 in FIG. 2, each floor can be provided with several walls 22 so that the floors 20 and walls 22 define the building as a multi-storey, multi-unit building. Alternatively, building 10 can be a single storey building or a single unit building, or both. A number of windows 24 can be provided in outer walls 12 at each floor 20 of the building. A personnel entrance 28 is provided through one of the outer walls 12 at the ground floor level to permit people to enter and leave building 10. If desired, a vehicle entrance 30 can also be provided, for example to a basement level garage 32.

FIG. 2 depicts an elevator car 34 moving vertically adjacent one outer wall 12 to provide access to the several floors 20 of building 10. Elevator car 34 is suspended and controlled by cables 36 which connect to equipment within penthouse 38 on roof 18. Of course, the elevator system can be located more centrally in the building interior, and another type of elevator, such as a hydraulic jack type, might be utilized, if desired.

FIG. 3 is a block diagram of an environmental control system in accordance with a preferred embodiment of the present invention which is suitable for incorporation into a structure such as building 10. A barometric pressure sensor 40 senses the ambient atmospheric pressure outside building 10 and provides an indication of that atmospheric pressure to controller 42. Pressurizer 44, which can be a conventional fan for the building heating, ventilating, and air conditioning system, is controlled by controller 42 to maintain the air pressure within building 10 at the desired level. If desired that interior air pressure can be maintained slightly above the exterior ambient atmospheric pressure, as disclosed in U.S. Pat. No. 4,608,785, the disclosure of which is incorporated herein by reference.

A heating and air conditioning unit 46 is connected through humidity controller 47 and an air cleaner 48 to pressurizer 44. Air which has had its temperature controlled by H/AC unit 46 and its moisture content controlled as necessary by humidity controller 47 to be within the range of from about 35% to about 55%, is cleaned by air cleaner 48 to remove in the order of about 99.9% of the impurities from the air, and the thus treated air is then fed to pressurizer 44. Controller 42 controls pressurizer 44 to maintain the air pressure within building 10 slightly above ambient atmospheric pressure, while distributing the heating and/or cooling air within the interior of building 10. Windows 24 preferably are closed, thereby maintaining the pressure differential. However, because building 10 is not air tight, the air pressure differential between the building interior and ambient atmospheric pressure results in a substantially continuous flow of air from the building to the outside of the building. This inhibits entry of pollen or other pollutants into the building.

To maintain the pressure difference between the interior of building 10 and ambient atmospheric pressure, one or more air locks is provided. For this purpose, entrance 28 to building 10 can include a first set of doors 50 and a second set of doors 52. If desired, one or both of the sets of doors 50, 52 can be a revolving door. Alternatively, if desired, the interior of elevator car 34 can serve as an air lock, as shown in U.S. Pat. No. 4,637,176, the disclosure of which is incorporated herein by reference. In that event, the pressure within the interior of elevator car 34 can be increased above atmospheric pressure as the elevator car leaves basement level 32 and can be returned closer to atmospheric pressure as elevator car 34 returns to basement level 32. The parking garage and/or other facilities within basement level 32 can be at ambient atmospheric pressure, if desired.

FIG. 4 is a block diagram depicting an air cleaning system suitable for use as air cleaner 48 within the environmental control system of the present invention. Fan 60 forces air from inlet 62 through pre-filter unit 66. The pre-filter unit removes larger particulates from the air and passes the air to medium efficient air filter device 68 which is an extended surface type air filter permitting the air to contact as large a surface of the filter media as possible. From filter device 68, the air is passed to a chemical and activated carbon filter device 70 in which additional impurities are removed. Next the air passes

through a high efficiency particulate air filter device 72 in which microscopic particles are captured. If desired, the air can then be passed through electronic air filter device 7 in which further microscopic particulates, such as pollen, are removed by electrostatic precipitation. From high efficiency particulate air filter device 72, or from electronic air filter device 74 if it is used, the treated air passes via outlet 78 to pressurizer 44. Measuring unit 76 monitors the cleanliness of the discharged air. The serial combination of filter devices 66, 68, 70, 72, and 74 removes in the order of about 99.9% of the impurities from the air, leaving the air suitable for the environmentally controlled building of the present invention.

Preferably, an air pressure measuring device 64 is provided on each side of each filter device 66–74 to provide an indication of the air pressure entering and leaving the filter unit, as depicted in FIG. 4. These indications are monitored, and the pressure drop across each filter device is indicated by unit 80. When the pressure drop across a filter device exceeds a predetermined amount, the components within that device can be cleaned or replaced, as needed.

The environmental control system of FIG. 3 can be utilized to control the environment within structures other than buildings. Thus, for example, the environmental control system might be utilized to control the environment within a motor vehicle such as bus 80 depicted in FIG. 5, a boat or ship, such as ocean liner 82 depicted in FIG. 6, or an airplane 84 depicted in FIG. 7, or within any other structure.

Although the present invention has been described with reference to a preferred embodiment, modifications and rearrangements can be made, and still the result would be within the scope of the invention.

What is claimed is:

1. An environmentally controlled building, comprising:
- an outer wall defining an outer building perimeter and having at least one fenestration therethrough for passage of personnel;
- a roof supported by and cooperating with said outer wall to define a building exterior and interior; and
- an environmental control system for controlling the environment within said building interior, said environmental control system including a heating and air conditioning unit, having an air inlet, for controlling the temperature of air drawing into said air control system; a humidity control unit, having an inlet connected to said heating and air conditioning unit, for controlling the humidity of air within said air control system; an air blower for forcing air from said environmental control system into said building interior; and an air filtering system having an inlet connected to said humidity control unit and an outlet connected to said blower, said air filtering system including a plurality of dissimilar air filtering devi[illegible] connected to permit serial passage therethroug[illegible] [illegible]ir from said humidity control unit, for removing particulates and impurities from air passing therethrough, a plurality of air pressure sensing means, one air pressure sensing means on each side of each of sai[illegible] air filtering devices to sense the air pressure on each side of each of said air filtering devices, and means coupled to said air pressure sensing means for indicating the pressure drop across each of said air filtering devices.

2. A building as claimed in claim 1, wherein said plurality of air filtering devices include:
- a prefilter unit having an inlet connected to sai[illegible] midity control unit for filtering larger partic[illegible] from air discharged therefrom;
- a medium effi[illegible] extended surface air filter d[illegible] having an [illegible]nnected to [illegible]prefilter u[illegible] removing smaller particulates [illegible] air discr[illegible] therefrom;
- a chemical air filter device having an inlet con[illegible]d to said extended surface air filter device for [illegible]ing impurities from air discharged therefr[illegible]nd
- a high efficiency particulate air filter devic[illegible]ing an inlet connected to said chemical air filt[illegible]vice for removing microscopic particulates [illegible] air discharged therefrom.

3. A building as claimed in claim 2, wh[illegible] said plurality of air filtering devices further include an electronic air filter device having an inlet connected to said high efficiency particular air filter device for electrostatic precipitation of microscopic particulates from air discharged therefrom.

4. A building as claimed in claim 1, wherein said blower comprises an air pressurization system for pressuring air discharged from said air filtering system and supplying the pressurized air to said building interior as substantially impurity free air.

5. A building as claimed in claim 4, further comprising:
- pressure sensing means for sensing ambient atmospheric pressure outside said building; and
- pressure control means for controlling said air pressurization system to maintain the air pressure within said building interior at a predetermined relation with the ambient atmospheric pressure outside said building.

6. A building as claimed in claim 4, further comprising air lock means cooperating with said at least one fenestration for permitting personnel to enter and exit said building interior without substantial loss of air pressure from said building interior.

7. An environmental control system for an enclosed structure, said system comprising:
- a heating and air conditioning unit, having an air inlet, for controlling the temperature of air drawn into said environmental control system;
- an air blower for forcing air from said environmental control system to the interior of an enclosed structure; and
- an air filtering system having an inlet coupled to said heating and air conditioning unit and an outlet connected to said blower, said air filtering system including a plurality of dissimilar air filterin[illegible] devices connected to permit serial passage [illegible]rethrough of air from said heating and air condi[illegible]ning unit, for removing particulates and impur[illegible]s from air passing therethrough, a plurality [illegible] pressure sensing means, one air pressure sen[illegible] means on each side of each of said air filter[illegible] devices to sense the air pressure on each side [illegible] and means coupled to said air pressure sensing means for indicating the pressure drop across each of said air filtering devices.

8. An environmental control system as claimed in claim 7, wherein said plurality of air filtering devices include:

a prefilter unit having an inlet connected to said humidity control unit for filtering larger particulates from air discharged therefrom;

a medium efficient extended surface air filter device having an inlet connected to said prefilter unit for removing smaller particulates from air discharged therefrom;

a chemical air filter device having an inlet connected to said extended surface air filter device for adsorbing impurities from air discharged therefrom; and

a high efficiency particulate air filter device having an inlet connected to said chemical air filter device for removing microscopic particulates from air discharged therefrom.

9. An environmental system as claimed in claim 8, wherein said plurality of air filter devices further include an electronic air filter device having an inlet connected to said high efficiency particulate air filter device for electrostatic precipitation of microscopic particulates from air discharged therefrom.

10. An environmental control system as claimed in claim 7 further comprising a humidity control unit, having an inlet connected to said heating and air conditioning unit and an outlet connected to the inlet of said air filtering system, for controlling the humidity of air discharged from said environmental control system.

11. An environmental control system as claimed in claim 7, further comprising an enclosed structure; and means coupling said blower to the interior of said structure for discharging air from said environmental control system into the interior of said structure.

12. An environmental control system as claimed in claim 11, wherein said structure is a building.

13. An environmental control system as claimed in claim 11, wherein said structure is a vehicle.

14. An environmental control system as claimed in claim 13, wherein said vehicle is an ocean liner.

15. An environmental control system as claimed in claim 13, wherein said vehicle is an airplane.

16. An environmental control system as claimed in claim 13, wherein said vehicle is a motor vehicle.

17. An environmental control system as claimed in claim 16, wherein said motor vehicle is a bus.

18. An environmental control system as claimed in claim 11, wherein said blower comprises an air pressurization system for pressurizing air discharged from said air filtering system and supplying the pressurized air to the interior of said structure as substantially particulate and impurity free air.

19. An air filtering system for an environmental control system, said air filtering system comprising:

a prefilter device having an inlet for filtering larger particulates from air drawn thereinto;

a medium efficient extended surface air filter device having an inlet connected to said prefilter device for removing smaller particulates from air discharged therefrom;

a chemical air filter device having an inlet connected to said extended surface air filter device for adsorbing impurities from air discharged therefrom;

a high efficiency particulate air filter device having an inlet connected to said chemical air filter device for removing microscopic particulates from air discharged therefrom;

a plurality of air pressure sensing means, one air pressure sensing means on each side of each of said air filter devices to sense the air pressure on each side of each of said air filter devices; and

means coupled to said air pressure sensing means for indicating the pressure drop across each of said air filter devices.

20. A system as claimed in claim 19, further comprising an electronic air filter device having an inlet connected to said high efficiency particulate air filter device for electrostatic precipitation of microscopic particulates from air discharged therefrom.

* * * * *

HEALTHY ENVIRONMENTAL AIR CONTROL SYSTEM

Retrofit and New Construction

1. Residential
2. Office Buildings
3. Hospitals
4. Medical Clinics
5. Retirement Centers
6. Nursing Homes
7. Hotels
8. Public Buildings
9. Schools and University Buildings
10. Shopping Malls
11. High Technology Manufacturing Facilities and Laboratories
12. Private Schools
13. Veterans Administration
14. Condo
15. Movies

_HBI Healthy Buildings International

COLUMBUS HEATING AND VENTILATING

Governor J. Rhodes Residence

2375 Tremont Road
Upper Arlington, Ohio

AIR QUALITY INSPECTION SUMMARY

November 1993

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Date April 1993	TABLE OF CONTENTS	2375 Tremont Road Upper Arlington, OH
Client Governor Rhodes		Page i

Date April 1993	AIR QUALITY SUMMARY	2375 Tremont Road Upper Arlington, OH
Client Governor Rhodes		Page 1

1 GENERAL INTRODUCTION

In April, 1993, Healthy Buildings International, Inc. (HBI) was commissioned to complete an indoor air quality assessment of Governor J. Rhodes Residence located at 2375 Tremont Road in Upper Arlington, Ohio.

The object of the survey was to evaluate the indoor air quality throughout the residence and to report on the custom-built high efficiency filtration system installed by Columbus Heating and Ventilating Company.

Quantitative and qualitative evaluations of the air supply and return systems and the air being transported were made using a variety of instruments and samples were taken for particulate and microbiological counting and analysis.

Visual inspections of the internals of the air handling ducts were made using existing access panels, grilles, diffusers, etc., where possible. Otherwise inaccessible sections of ductwork were accessed by insertion of points into the ductwork and were viewed with an industrial borescope fitted with its own fiber-optic light supply system.

Samples for analysis were submitted to laboratories accredited where required in the appropriate methodology and staffed by technicians trained and experienced in accepted procedures.

All the measurements and observations recorded on-site and the laboratory results from the samples collected were collated, analyzed, and evaluated. It is from these readings along with the extensive data base of information on similar air systems available to HBI that the conclusions and recommendations in this report are made.

Date April 1993	AIR QUALITY SUMMARY	2375 Tremont Road Upper Arlington, OH
Client Governor Rhodes		Page 2

2 THE BUILDING AND ITS AIR HANDLING SYSTEMS

2.1 General Description of the Building

The Governor's Residence located at 2375 Tremont Road in Upper Arlington, Ohio is a three-story structure that was built in 1926. It is approximately 3,300 square feet in area distributed over first and second floors and a full basement.

The heating and air conditioning needs are provided by two separate air handling units (AHUs). One located in the north side of the basement serves the second floor, part of the first floor and the north end of the basement. The other, located in the south side of the basement, serves the first floor den and the south side of the basement.

Both units are interconnected by a common supply of outdoor air blended with return air. What sets this residence apart is the ultra-efficient air filtration system that is used to purify the outdoor air and that fraction of the return air recycled throughout the residence.

2.2 General Description of the Air Systems

Both the north and south AHU's function in a similar manner as follows: A centrifugal fan in each unit draws the air from the filtration unit and propels the air through a natural gas heater and a set of refrigerant cooling coils before entering the main air supply duct. This main air supply duct than branches into secondary ducts that deliver air to the rooms of the residence through supply grilles located in the floors or walls.

Return air is drawn into floor level return grilles and enters ducts that travel to the north end of the basement. These return ducts lead to a larger duct that breaches the basement wall and returns the air back to the filtration unit, through an electrically controlled damper, to mix with outside air to start the cycle again.

Outside air enters the filtration unit through louvers located on the side of the unit and passes though an electrically controlled damper before entering the mixing chamber to combine with building return air. The mixed air is drawn through three banks of filters including a medium efficiency pleated panel, higher efficiency vericel filters and finally a high efficiency HEPA filter before entering a centrifugal supply air fan. The air is then filtered further as the supply air fan propels the air through three more banks of filters that consist of the following: an activated charcoal filter, a potassium permanganate filter and finally another high efficiency HEPA filter. After this extensive filtration the air enters a supply duct that breaches the basement wall and splits into two branches, one of which supplies air to the north unit, and the other supplies air to the south unit. Prior to branching the supply duct is equipped with a steam type humidifier that adds humidity to the air during the drier winter months.

Date April 1993	AIR QUALITY SUMMARY	2375 Tremont Road Upper Arlington, OH
Client Governor Rhodes		Page 3

2.3 Visual Inspections of the Air Handling Units

The internal chambers of each air handling unit and its associated ductwork was visually inspected with the aid of fiber optic borescopes. All parts were found to be in very good condition with respect to both overall levels of cleanliness as well as mechanical integrity.

At the time of our inspection the air supply delivered to the filtration system and thence to the AHUs was approximately 75 percent return air plus 25 percent outdoor air.

The filtration unit itself was in good structural condition. Each bank of filters was well installed such that there was no air allowed to bypass the filters. Each filter was only lightly soiled and the whole assembly was judged to be in first-class condition.

Fiber optic inspection of the supply and return ducts throughout the house showed all sections to be unusually clean and in good condition. The ductwork had been installed with care and is now protected by an ultra-efficient filtration system.

Date: April 1993	AIR QUALITY SUMMARY	2375 Tremont Road Upper Arlington, OH
Client: Governor Rhodes		Page 4

3 **FILTRATION EFFICIENCY**

For background information, and as a yardstick to assess the efficiency of the installed filtration unit, the following comparative data is relevant.

When comparing filter efficiencies of different types and sources of materials, a standardized test protocol is required. The efficiency rating most applicable to ventilation systems serving areas inhabited by humans is that defined by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). Their standard 52-76 defining the Atmospheric Dust Spot Test (ADST) is most relevant to fine airborne particles prevalent in homes or office environments.

Typical ASHRAE (ADST) efficiencies for filters are:

Type of Filter	Efficiency
Typical fiberglass furnace filter as used in most residences	10-20%
Pleated panel filters, typical of most offices and some homes	20-35%
Electrostatic media filters used in homes or offices	15-30%
High efficiency bag or box filters used in laboratories, hospital and patient areas	30-65%
Electrostatic precipitators, e.g., Smokeaters, Honeywell and Carrier products or their equivalents	80-98%
HEPA filters, high intensity care areas of hospitals, operating rooms, etc.	99.95%
Columbus Filtration System in the Governor Rhodes residence	99.95%

The particulate filter installed in series within the filtration unit, when operated as designed, will preclude the passage of virtually all dusts or fibers and will stop all microbes including bacteria, fungi or viruses.

Moreover, the filter banks of activated charcoal and potassium permanganate effectively remove virtually all odorous gases and vapors including most volatile organic compounds found in all homes or offices.

Test Results	Particle counts
Average airborne particle counts outdoors	275,000-384,000
Airborne particle counts inside air supply ducts in house	420-3,050*
*Units are number of particles per cubic foot of air equal to or larger than 0.5 microns in diameter	

Date April 1993	AIR QUALITY SUMMARY	2375 Tremont Road Upper Arlington, OH
Client Governor Rhodes		Page 5

4 **EFFECTIVENESS OF THE HVAC SYSTEMS**

Many heating, ventilation and air conditioning contractors assume that their function is to install equipment that provides comfort to the building occupants. Comfort is a state of mind that is normally experienced when the temperature, humidity and air movement fall inside certain predetermined bands. Obviously attaining these comfort bands is important to the occupants, but another basic function of all ventilating systems is often forgotten. Ventilation itself is a process where "fresh" outdoor air is introduced to an area as stale air is removed. This implies dilution of contaminated air with uncontaminated air.

Too many HVAC systems simply recycle the same old stale air around and around inside the property. In the case of residential systems, most use recycled air only. Worse still, most residences also employ cheap, inefficient filters that allow indoor pollutants to be recycled in the stale air. Thus, although temperatures may be comfortable, the air quality can be deplorable.

Columbus Heating and Air Conditioning Company, in the HVAC design of this residence have addressed these issues and have created a system that excels, indeed exceeds virtually all known standards for comfort <u>and</u> air quality.

The very satisfactory temperature, humidity and filtration standards attained within this residence are given elsewhere in this report. With respect to air quality, a yardstick that indicates the rate of dilution of internal pollutants by ventilation, is given by measuring carbon dioxide concentrations.

Every person breathes air containing oxygen into their lungs. Some of this oxygen is converted in the body into carbon dioxide. Thus, the exhaled air is richer in carbon dioxide than the inhaled air.

We all realize that we suffocate if we stick our head inside a sealed polyethylene bag. Suffocation is caused by the progressive concentration of carbon dioxide and depletion of oxygen. While houses and office buildings are not sealed as tightly as polyethylene bags, a well-insulated property with closed windows and doors does exhibit similar properties. Carbon dioxide levels do accumulate, and if the carbon dioxide is trapped inside the property, then all other airborne pollutants, dusts, gases, vapors, fibers, bacteria, fungi, etc. are also trapped.

Indeed, recognizing this fact ASHRAE has stipulated that all office buildings must bring in sufficient outdoor air to ensure that the internal carbon dioxide concentration does not exceed 1,000 ppm. For reference, the outdoor air average carbon dioxide concentration is about 350 ppm.

Date April 1993	AIR QUALITY SUMMARY	2375 Tremont Road Upper Arlington, OH
Client Governor Rhodes		Page 6

4.1 Carbon Dioxide Monitoring

Over 24-hour periods, the carbon dioxide levels in different rooms of this residence were recorded on a data logger.

Location	Carbon dioxide (ppm)
Outdoors	350
Maximum reading in home	598
Minimum reading in home	426
Average value in home	492
Comparative value — typical residences	400-1500
Comparative value — typical office environments	400-2000
Suggested maximum acceptable by ASHRAE	1000
Note: Readings over 800 ppm indoors often indicate "Sick Building Syndrome" conditions	

CONCLUSIONS

The ventilation system installed in this property is providing far more ventilation air than is normal. This, coupled with the excellent standards of filtration, ensures that the air quality with respect to airborne pollutants within this residence matches the highest standards normally reserved for intensive care areas of hospitals.

Date April 1993	AIR QUALITY SUMMARY	2375 Tremont Road Upper Arlington, OH
Client Governor Rhodes		Page 7

4.2 Temperature and Relative Humidity

4.2.1 Temperature

ASHRAE recommends year round comfort temperature ranges of:

Summer: 73-79°F
Winter: 68-75°F

Readings taken in April 1993

Maximum: 76.4°F
Minimum: 72.7°F

These values are sufficiently close to the ASHRAE optimum value to satisfy the occupants of this property.

4.2.2 Relative Humidity

ASHRAE recommends year round comfort ranges of 30 to 60% relative humidity for indoor air.

Readings taken in April 1993

Maximum: 49.2%
Minimum: 31.2%

These values fall comfortably within the ASHRAE optimum range to satisfy the occupants of this property.

Date April 1993	AIR QUALITY SUMMARY	2375 Tremont Road Upper Arlington, OH
Client Governor Rhodes		Page 8

5 Airborne Microbe Counts

Most of us recognize that airborne germs, whether bacteria, fungi, or viruses help spread diseases. The risk of contamination increases as the concentration of such germs increases in the air. Thus, the more germs that can be removed from the air by efficient ventilation and filtration systems, the better. However, since these microbes can multiply at alarming rates, it is extremely difficult to set an acceptable standard in counting such organisms. For example, counts at one hour of the day may be significantly different from those from another hour of the same day.

One useful yardstick in assessing airborne microbial content is to compare the counts indoors with those outdoors at the same time.

Readings taken in April 1993

	Colony forming units per cubic meter of air		
Location	Bacterial	Fungal	Total
Outdoors	924	648	1,572
Indoors:			
Maximum	378	108	486
Minimum	12	13	25
Average	177	51	228

Note: None of the organisms detected in the air inside or outdoors on the days of our tests were pathogenic. All were typical and relatively harmless dust organisms. Of particular relevance was the fact that the indoor air contained less than 15 percent of the microbes present in the outdoor air. This clearly demonstrates the efficiency of the ventilation and filtration systems installed in this property.

Date: April 1993	AIR QUALITY SUMMARY	2375 Tremont Road Upper Arlington, OH
Client: Governor Rhodes		Page 9

6 Gases and Vapors

Volatile organic compounds (VOCs), including formaldehyde, benzene, toluene, xylene and numerous others are given off from paints, polishes, waxes, plastics, people, pets, plants, automobiles, chemical plants and virtually all processes conducted inside buildings, including copying, cooking, smoking, dry cleaning, etc.

In recent studies published by the Environmental Protection Agency (EPA), it was shown that indoor concentrations of many of these potentially harmful chemicals usually substantially exceed outdoor concentrations — even in polluted urban areas. This is due to the fact that there are more sources of such chemicals indoors.

Rarely do residential or commercial ventilating systems address this problem. However, in the case of the Columbus design, two gas and vapor absorbing systems were incorporated into the filtration system. One comprises activated charcoal to absorb and remove many gases from the airstream. The second uses potassium permanganate impregnated pellets to break down other gases by oxidation and remove them from the airstream.

The effectiveness of these devices is illustrated in the test results shown below.

Readings taken in April 1993

Note: Indoor concentrations were determined in the basement, dining room and living room of the house.

	Micrograms per cubic meter of air	
Chemical compound	Outdoor readings	Indoor readings
Benzene	2.9	<D.L.
Ethylbenzene	1.9	<D.L.
Formaldehyde	<D.L.	<D.L.
Toluene	28.2	<D.L.
Xylene	150.0	<D.L.
Other VOCs	<D.L.	<D.L.
<D.L. = less than the detection limit of the test		

In no instance were any airborne chemicals detected within this property despite the fact that high volumes of outdoor air containing some chemicals were being drawn into the house. This clearly indicates the efficiency of the gas-absorbing filters installed on the HVAC systems.

Date April 1993	AIR QUALITY SUMMARY	2375 Tremont Road Upper Arlington, OH
Client Governor Rhodes		Page 10

7 **Conclusions**

The ventilation system installed in Governor J. Rhodes' residence in Upper Arlington, Ohio is far superior to conventional systems.

7.1 It delivers well above average outdoor air ventilation rates to the occupants.

7.2 The filtration efficiency for particulates exceeds all recommended standards for homes or commercial establishments. The airborne dust, particulate levels, and microbe content delivered to the occupied areas matches standards typically reserved for hospital operating rooms and intensive care areas.

7.3 The use of absorbent filter beds incorporated into the main filtration unit effectively removes typical volatile organic chemicals either generated inside the property, or those brought in from outdoor sources.

7.4 The correct sizing of the heating and cooling coils, plus the judicious use of the installed central humidifier enables optimum comfort conditions to be realized for all seasons of the year.

7.5 We were impressed at the high standards of cleanliness and integrity of installation of the HVAC components and their associated filtration systems.

7.6 Presuming that the current standards of services and maintenance, plus the recommended replacement of filter components is maintained, the occupants of this residence will enjoy far cleaner, fresher and healthier air quality than virtually any other property in the U.S.

Diana Fairechild

PO Box 300

Makawao HI 96768

May 13, 1994

James Oberstar, Minnesota

Chairman, Aviation Subcommittee

US House of Representatives

Washington DC 20515

Re: Airliner Cabin Air Quality hearing May 18, 1994

Dear Congressman Oberstar:

Please include the following statement (eight pages total) in the record of the above mentioned hearing and distribute it to all members of the Aviation Subcommittee. Congresswoman Mink has offered to present this to you on my behalf.

Diana Fairechild

Diana Fairechild

TO: James Oberstar

FROM: Diana Fairechild

May 13, 1994 / Page 2

I am a veteran airline flight attendant who finds herself at the very center of a legal and medical controversy over airline air quality.

During the 21 years I worked for the airlines, I was repeatedly exposed to pesticide. I was required to inhale it, and to have it on my skin, in my eyes, and on my clothing. Because of these workplace exposures (I estimate over 100 of them), I have acquired multiple chemical sensitivities (MCS). MCS is the breakdown of the body's ability to detoxify everyday chemicals; it is triggered by significant exposure to a toxic chemical, either a single crippling dose or through repeated small doses.

The illness developed for three years prior to my total disability. During that time my eyes became infected, I lost motor coordination, and I incurred memory problems. My eyes dripped yellow pus within hours of spray, then cleared up after a day or two of rest along with antibiotic treatment. This condition developed into chronic blepheritis (bugged-out scaly skin around

TO: James Oberstar

FROM: Diana Fairechild

May 13, 1994 / Page 3

the eyes) and itchy conjunctivitis that no longer responded to medication. The motor problems began with dropping of trays in the aisles and falling down on layovers, then progressed into burning myself on ovens and coffee makers and, on one occasion, leaving the plane in a wheelchair. The memory problems manifested as forgetting to bring my suitcase on trips, forgetting the on-board service flows, and even forgetting what cities we were arriving in, for which the airline called me in and told me to see a psychiatrist.

In December 1987, I was medically grounded with flu-like symptoms. I was examined by the airline doctor, who kept me off flight status due to fever, respiratory infection, and overall weakness. I was too weak to stay awake more than a couple of hours sequentially, so I knew I couldn't go back to work. Every day I'd question myself whether I was strong enough yet. Every day I expected to bounce back. I was weak-kneed and weak kidney-ed. I couldn't digest food. I had back aches, headaches, fevers, rashes, and a couple dozen more problems too personal to enumerate here. I had a number of car accidents and also bouts of amnesia where I didn't know what city I

was in. I became afraid to leave the house. After about five months I was finally diagnosed, and with the help of my doctor I began the long road of coping strategies.

For the past six years every day has been a cautious adjustment to, or avoidance of, environmental dangers completely unknown to most people. I am allergic to Windex, hair spray, deodorant, perfume, glue, paint, dry-cleaned clothes, car exhaust, the interiors of relatively new cars, felt tip pens, fabric softener, mold, newsprint, the finish on new clothes and sheets, toothpaste, and much more. I cannot go to the theater, take a class, walk into a grocery store during busy hours, rent a car, go to the beauty parlor, or attend Church services.

MCS is not a psychological condition. Before the onset of this illness and, in fact, for the first eighteen years of my airline career, I lived a robust, adventurous life completely unhampered by physical distress. The only psychological aspect of my present condition is the daily struggle against depression and fears

TO: James Oberstar

FROM: Diana Fairechild

May 13, 1994 / Page 5

associated with this unwanted disability. I live in a 500-square foot wooden structure without carpeting, drapery, or upholstery. I clean my home with baking soda and vinegar. I eat a simple diet of primarily organic foods. I avoid most social interactions.

I filed for Workers' Comp in mid 1988. My case is presently on appeal; the hearing at the State of Hawaii Labor & Industrial Relations Appeals Board took place three years ago, and no decision has been made. No reason for the delay has been given.

United Airlines, my employer, disputed, and still disputes, both the validity of my illness and the fact that it occurred on the job. My treating physician and other medical experts have testified that I became sick as a result of the pesticides sprayed on me in my workplace. In addition, flight log reports and physicians' reports show a well-documented chronology of acute symptoms within hours of spray.

Several months ago, it was disclosed that the insecticide used in

TO: James Oberstar

FROM: Diana Fairechild

May 13, 1994 / Page 6

airline cabins is actually Black Knight Roach Killer--but with a different label. The aircraft label states, "Spray all spaces within the aircraft...with crew and passengers on board," with the contradictory advice, "Hazardous to humans...avoid breathing vapors. Avoid getting on the skin." The "Killer" label states, "If inhaled, remove victim to fresh air." Obviously, this remedy is impossible on jets.

Since five years I live in isolation. While the bulk of my time and money is consumed by health issues, I attempt to eke out a living from home as a writer. Two years ago I published a book, *JET SMART,* to warn travelers of a number of environmental hazards in jets. As a result I have received a lot of attention in the press. I am including a list of some of these mentions (please see Exhibit) to show you that, clearly, the subject of airliner air quality is of public concern.

Last month, Secretary Federico Pena wrote, on President Clinton's behalf, to twenty countries where on-board pesticiding still

TO: James Oberstar

FROM: Diana Fairechild

May 13, 1994 / Page 7

takes place: "Concern over the spraying of insecticides inside the aircraft cabin is based on possible long-term health effects." My health problems fall into this category.

During the Reagan era the U.S. Ambassador to New Zealand was on one of my flights. I begged him to help put a stop to this practice of pesticiding passengers and crew. He said there was nothing he could do. Now I beg you. Please, do whatever is in your power to help these countries to "get it" before the insidious effects of accumulative pesticide exposure gets all of us.

I urge you to take a stand against the practice of pesticiding passengers and crew on jets.

Diana Fairechild

Diana Fairechild

Enc: Exhibit

TO: James Oberstar

FROM: Diana Fairechild

May 13, 1994 / Page 8

EXHIBIT: partial list of *JET SMART*/Fairechild mentions. Copies of all articles are available upon request. I sent you *JET SMART* last week. If you would like additional copies, please let me know.

* *Forbes FYI*, "...a flight attendant tames jet lag."
* *Reuter*, "Find it hard to breathe on airplanes? Book explains..."
* *Barron's*, "Lofty Spraying Bugs Travelers So Pena Pens a Protest."
* *Conde Nast Traveler*, "How long before toxic sprays are banned?"
* *Business Week*, "Clearing the Air Indoors."
* *USA Today*, "Common-sense tips outmaneuver jet lag."
* *Glamour Magazine*. "Flight attendant tells all."
* *US Air In-Flight Magazine*, "Nontraditional methods...your body clock.."
* *GQ Magazine*, "Words to Fly By."
* *The New York Times*, "For airplane passengers the...doctor's office."
* *Newsday*, "Flying: The View from the Aisles."
* *Chicago Tribune*, "Only the strong and well-equipped survive."
* *Sacramento Bee*, "Spray Humans With Roach Killer?"
* *San Francisco Examiner*, "Defending against flying microbes."
* *The San Diego Union-Tribune*, "Pesticide risk...on board flights."
* *Miami Herald*, "...foreign destinations...'disinsecting.'"
* *Saint Paul Pioneer Press*, "Fliers bugged by in-cabin insecticide."
* *Honolulu Star-Bulletin & Advertiser*, "...beat the jet-lag syndrome."
* *Corporate Travel*, "Conquer Jet Lag."
* *Frequent Flyer*, "...fight jet lag."
* *Journal of Business Strategy*, "Traveling Without Unraveling."
* *Successful Meetings*, "Anti Pesticide Forces Get a Proponent."
* *American Express Corporate Card Newsletter*, "A Healthy Way to Fly."
* *Meeting News*. "A veteran flight attendant's guide to healthy flying."
* *Family Life*, "Healthy Flying For Kids."
* *Townsend Letter for Doctors*, "Unfriendly Skies."
* *The Environmental Physician*, "Jet Lag is a Problem of Environmental Health."
* *American College of Nuclear Physicians Newsletter*, "How to Sleep on Jets."
* *Journal of the Association of Interpreters*, "Inside Advice on...Jet Lag..."
* *ASU Travel Guide for Airline Employees*, "The Problems of Jet Lag."
* *Travel Agent Magazine*, "...stay in shape during long airplane rides."
* *Bottom Line*, "Jetting East or West."
* *Earth Journal*, "Flying in the Mist."
* *Informed Consent*, "Trouble in the Sky."
* *Environ*, "Everything you may not want to know about flying."
* *The Maui News*, "Maui author an environmental canary who can help save us."

29 April 1994

The Honorable James L. Oberstar
Chairman, Aviation Subcommittee
U.S. House of Representatives
Washington, D.C. 20501

Dear Mr. Oberstar:

I applaud your decision to hold hearings on the problem of air quality in airline cabins. I have pulmonary hypertension, and dread flying because of the poor air. My doctor says that I must use continuous in-flight oxygen on most flights. It is difficult to arrange for this oxygen, expensive, and at least one airline flatly refuses to provide it.

As a private pilot, I have learned to be sensitive to decreases in oxygen as altitude increases. As you know, U.S. airlines generally pressurize to about 7 or 8,000 feet. On one occasion when I was not using supplemental oxygen, I sensed a drop in the amount of oxygen, and asked a flight attendant to check with the captain. She did so and told me I was right, that the pilots had turned down the air pack (to save fuel and money, presumably). The air pack was turned back up to legal levels.

This thinness of the air exacerbates the problem. I read in today's New York Times of the Air Transport Association's recent study which purports to find that airliner air is healthy. Few details were given, but those that were used phrases like "parts per million." It is not the just percentage of oxygen, but the total amount that matters. A sample of 35 flights is far to small to be authoritative. When was the sample done? During the winter, when there are far more sick people aboard spreading viruses? Did it consider the spread of tuberculosis? Even one airliner-transmitted case of TB would be too many. Did it include northern routes, where there is far more ozone, a serious health problem? I have read that ozone filters can clog up after a single flight, and that filters are not changed nearly as often as they should be.

Most people with heart or lung problems, or with compromised immune systems, seem unaware that air travel is hazardous to them. Therefore, disclosure should be an important part of any legislation. Passengers should be warned at the time they make reservations that air travel poses possible risks to their health. They should be told how much fresh air and oxygen will be available on their particular aircraft. They should be told of the availability of in-flight oxygen, and

be encouraged to check with their doctors to learn whether they need it. Finally, passengers should be warned of in-flight symptoms that might indicate they are receiving poor air, and be instructed to alert a cabin attendant so they could be given oxygen.

Apparently first-class passengers get more fresh air than economy-class. This is reprehensible. Money should not be able to buy safety aboard a commercial airliner. Imagine the outrage if studies showed that first-class passengers were more likely to survive a crash! (Studies have not shown this, of course.)

Several days ago I returned from Europe. We had no choice but to take an airline that allowed smoking. The minute the no-smoking sign went off the stench of cigarette smoke filled the entire cabin and people began squabbling with the cabin attendants, begging for seats farther away from the smokers. I was using supplemental oxygen, and when a man about seven feet from me began smoking, I asked to be moved for safety reasons. The steward agreed this was essential (the airline had neglected to consider, when seating me as far away from smokers as they could in the economy section, that persons at the back of the first-class section would smoke). Because the toilets were near smokers, I could not take oxygen with me when I wanted to use one. On a nine-hour flight, lines are long at the toilets, and I had to stand in smoke while I waited, dizzy and gasping for air. So for heavens sake, please do something to make it possible for Americans to travel internationally without be subjected to second-hand cigarette smoke.

Because of my pulmonary hypertension, I'm a lot like those canaries miners used to carry down into mines with them, to tell then when the air was bad. I fly a lot, and I <u>know</u> the air is terrible on airliners.

I hope your hearings generate useful information, and that they draw public attention to this problem.

Sincerely,

Gail Boyer Hayes

Gail Boyer Hayes
2301 38th Ave. East
Seattle, WA 98112-2416

120 Hidden Falls Lane
Atlanta GA 30328-1960

(404)393-8244

Hon. James L. Oberstar
Chair, House Aviation Subcommittee
U.S. House of Representatives
Washington, DC 20515

June 17, 1994

Dear Rep. Oberstar,

Although progress is being made in the form of the Smoke-Free Environment Act, a serious omission from the act is any consideration (as I understand it) of a comprehensive ban on smoking on airplanes on international flights. U.S. flight attendants deserve the same workplace protection as other U.S. workers, yet those who have to work in the smoking section of an airplane on an international flight are subject to a far worse environment than in the average office building. If you have walked through the smoking section on an international flight you will know how foul the atmosphere is. I'm glad to see that your Committee is investigating this.

I have a personal interest in the application of a ban. My wife is a flight attendant, and since she speaks several foreign languages she flies international routes. When she arrives home after after a working trip, her clothes and hair stink of tobacco smoke. It angers me that she is expected to work in the fumes of a known carcinogen, and that her health (and life expectancy) is undoubtedly adversely affected.

I understand that airlines would be only too happy to ban smoking, were it not for the loss of revenue from smokers. The ban would therefore have to apply to all carriers that operate into the United States, including foreign airlines.Other Federal Aviation Regulations (such as noise regulations of FAR Part 36) also apply to foreign carriers, so that any regulations incorporated into FAR Part 121 (or however the ban would be enacted) could also be made to apply to foreign-registered airplanes that fly into the United States.

I hope that you will persuade the House to enact a total ban on smoking on commercial airplanes flying into the United States.

Yours sincerely,

Anthony P. Hays

e:\uscongrs\waum4513.txt

Seven Springs Ranch
Post Office Box 697
Cupertino, California 95015

June 15, 1994

Representative James Oberstar
Chairman, Aviation Subcommittee
Public Works and Transportation Committee
1233 Longworth
House Office Building
Washington D.C. 20515

Dear Congressman Oberstar:

As a 71 year old woman and frequent world wide air traveler, I am outraged at the decreased amount of fresh air available to passengers on airline flights. It is unacceptable that as consumers, our health is at risk in order to save the airlines money. With the current limited circulation of fresh air, we are not only talking about an increase in common cold germs shared on flights, but other more serious airborne diseases, such as tuberculosis. Children and older adults are particularly vulnerable. This large risk of exposure can be easily reduced with more fresh air and oxygen.

I understand that there are prescribed amounts of fresh air and oxygen required for pilots, but no such recommendations required for passengers, and that air cabins receive far less than the cockpits. I applaud your efforts to improve cabin air quality and support HR 2985, Defazio's Airline Cabin Air Quality Bill.

Sincerely,

Dorothy S. Lyddon

Dorothy S. Lyddon

Helen G. Morris, M.D.
6355 Euclid Road
Cincinnati, Ohio 45236

(513) 791-3501

April 25, 1994

Rep. James J. Oberstar
Chairman, Aviation Subcommittee
Public Works & Transportation Comm.
U.S. House of Representatives
Washington, D.C.

Dear Mr. Oberstar:

I was pleased to read in the newspaper that your Committee was planning to take up the issue of air quality on commercial aircraft. This is an issue that concerns me greatly, but previously I have not known whom to contact. My interest is both personal and professional.

As a research physician, I find it necessary to make a number of short business trips each year, with most trips lasting 1-4 days and requiring 2-4 hours each way on an airplane. During the past two years, almost every single domestic trip has been followed by a respiratory illness that lasted up to two weeks and interfered significantly with my personal and professional activities. On some occasions, I have become ill shortly after the outbound flight and I have had difficulty in accomplishing the goals of the trip.

In an attempt to protect myself, I have begun wearing a surgical mask on each flight and I have found that this step, without any other change in my activities, resulted in a decrease in frequency and severity of infection. However, the mask must be worn continuously. On a recent flight from California to Cincinnati, I became infected when I removed the mask for a few minutes to drink some liquids, but my respiratory infection was considerably less severe than that of a travelling companion who was not wearing a mask.

On the basis of my own experience, I am convinced that the respiratory infections are acquired on the aircraft. Paradoxically, the risk of infection seems to have increased greatly since smoking was

banned on most commercial flights. Previously, because of the foulness of the air and the blue haze of the smoke, the airlines may have flushed the air in the cabin more frequently.

Clearly, respiratory infections, which are usually of viral origin, reduce productivity and are uncomfortable and inconvenient for most individuals; however, for some people, these infections represent a serious risk.

My concern is that the risk of airborne infection will become an increasing hazzard as air travel and the crowding on flights increase. Unless steps are taken to exchange the air more frequently and to reduce the quantity of infectious agents (perhaps by filtering airplane air through a bacteriological filter), air travel will pose an increasing medical risk. Furthermore, the risks may not be limited to those which cause most infections currently, but may include other more virulent viruses or other airborne infections such as tuberculosis.

I applaud your interest in these issues and I sincerely hope that your committee will be able to identify some ways to improve the situation. I would be happy to help in this endeavor in any way that I can.

Very sincerely yours,

Helen G. Morris

Helen G. Morris, M.D.

April 25, 1994

Representative James Oberstar
Chairman, Aviation Subcommittee
Public Works and Transportation Committee
United States Congress
Washington, DC

Dear Mr. Oberstar:

I read with interest an article regarding your hearings on the air quality on domestic airliners. Specifically you stated that there has been a 50% reduction of fresh air in airline cabins since the late 1980's.

I am a 57-year-old neurosurgeon who is not in the habit of writing public officials. I have been very unhappy with the frequency with which I have returned from a trip on a commercial airliner with an upper respiratory tract infection. In fact, the last three out of four times that I have flown on a commercial airliner I have developed an upper respiratory tract infection. I am seriously considering wearing a surgical mask the next time I fly on an airliner.

I have had some of my patients voice similar complaints and I believe that the result of the increase in upper respiratory tract infections is due to the poor air quality on our commercial airliners.

I hope that you can appropriately address this matter.

Sincerely yours,

Steve Padar

Stephen C. Padar, M.D.
SCP:gd

d: 4/25/94
t: 4/26/94

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NCAP

Northwest Coalition for Alternatives to Pesticides

COMMENTS TO HOUSE SUBCOMMITTEE ON AVIATION

Re: Airline Spraying of Passengers with Insecticides on International Flights

May 18, 1994

The following comments are submitted by the Northwest Coalition for Alternatives to Pesticides on behalf of our 1,500 members nationwide.

Background

NCAP first learned of the airline practice of spraying insecticides in occupied passenger cabins on international flights in 1992. Dr. Julius Kleiner of New York wrote us a letter detailing an episode in which his wife experienced an allergic reaction when sprayed while flying to Australia in 1988. After we publicized his letter in our journal, we received letters from other aircraft spray victims, and learned of Diana Fairechild, a flight attendant now living in Hawaii, who blames repeated exposure to airline sprays for her chemical sensitivity. Eventually we learned of Julia Kendall, a San Rafael woman who was sprayed and is now suing the airline, blaming the spraying for her relapse of leukemia. Recently, we sent an Action Alert to our members, and received yet more mail or had contact with individuals who had been directly sprayed (and in some cases injured) while on international flights.

We have learned from news accounts that spraying of occupied airline passenger cabins is apparently mandated by many countries, including Australia, New Zealand, most central American countries, and others. While many types of pesticide spraying create health problems for exposed individuals, there is something especially appalling about this practice, where passengers receive no advance notification, and are literally a captive audience as poisons are applied directly over their heads and into their breathing space. It was especially shocking to learn that some individuals who did know enough to ask about airline spraying in advance, such as Terry Lew of Del Mar, California, were told that they would not be sprayed (or that they could deplane prior to the spraying), and then were, in fact, sprayed.

According to media accounts, the U.S. Center for Disease Control in 1979 wrote that routine disinsection of planes with passengers on board causes undue discomfort to many passengers, and places passengers at risk of acute anaphylactic reactions. In 1983, the Assistant Surgeon General wrote that "the U.S. cannot support the use of insecticides in aircraft areas with passengers present. Pesticides registered for such use should not be inhaled. In effect, the safety issue precludes a U.S. requirement for disinsection." The memo goes on to say that the disinsection of aircraft is "not highly effective in disease control or in species containment."

P.O Box 1393
Eugene, Oregon 97440
(503) 344-5044

Despite these steps to halt this practice in our own country, U.S. citizens are still being unnecessarily exposed to hazardous insecticides by U.S. and other airlines abroad. This practice is barbaric and unnecessary, and the U.S. should take all steps possible to convince other countries to halt the practice immediately.

Reported Human Health Effects of Airline Spraying

Unsuspecting passengers, including pregnant women, infants, chemically-sensitive, elderly, or immune-compromised individuals (e.g., those undergoing cancer treatment) are doused with pesticide, yet no consideration is given to individual health status as passengers are blithely told that the spray is "safe" or won't harm humans. Passengers have reported symptoms including throbbing head, aching joints, swollen lymph glands, chills, swollen and itchy eyes and face, choking and coughing. One passenger, Mollie Gillen, blames airline spraying for the death of her husband, and another, Julia Kendall, blames airline spraying for the recurrence of her leukemia.

Of course, as is often the case, it is workers, including those on U.S. airlines, that experience the worst exposures. Flight attendant Diana Fairechild reports that she would lose motor coordination and yellow pus would drip from her eyes following exposure to the aircraft sprays. She has now developed multiple chemical sensitivity (MCS), a condition that she and her doctor blame on her repeated exposure to pesticide sprays during flights to Australia and New Zealand. Ms. Fairechild is unable to work, as she continues to experience seizures, internal bleeding, rashes, fevers and more. Pilots, too, have complained of the practice of spraying aircraft cabins. Some wear respirators when the spraying begins. Others are chemically sensitive from previous pesticide exposures, and unable to fly the New Zealand and Austalia routes because of the health risks of additional exposures.

Pesticides Registered for Use in Occupied Airline Passenger Cabins, and Their Potential Acute Health Effects

The synthetic pyrethroid d-phenothrin is the active ingredient of several products registered for use in occupied airplane cabins, including Airosol Aircraft Insecticide and DLA Insecticide. The Material Safety Data Sheet (MSDS) for the latter product indicates that acute health hazards of exposure include dizziness, frostbite, and skin irritation, and that "overexposure due to inhalation may cause temporary central nervous system effects, dizziness, headache, confusion, stupor with the exclusion of oxygen and with grossly excessive over-exposure." The MSDS goes on to say that "Individuals with preexisting diseases of the cardiovascular system may have increased susceptibility to the toxicity of excessive exposures, heart irregularities..." It also says that inhalation exposure is possible if there is unsatisfactory ventilation, and that eye and skin exposure is possible if protective eyewear is not worn or if skin is left unprotected.

The label of Airosol Aircraft Insecticide says: "Hazardous to humans and domestic animals. Harmful if swallowed or absorbed through the skin. Avoid breathing vapors. Avoid contact with skin and eyes. Remove pets, birds and cover fish aquariums before spraying. Ventilate area before reentry." However, directions for use say: "Use while aircraft is in flight or on the ground prior to takeoff. Use at least 30 minutes prior to landing. Spray all spaces within aircraft after loading is completed, crew and passengers

are on board, and all doors, hatches and ventilation openings are closed. Stop ventilation system for a period of not less than 3 minutes after spraying."

We understand that EPA is now looking in to the matter of the apparent inconsistencies on this label. Clearly this product is used in a manner that does expose passengers to the spray. The area is not ventilated prior to their entry, and the spray does come in contact with passengers' skin and eyes. Passengers unavoidably breathe vapors, since the aircraft ventilation system is turned off while the spraying is done directly over their heads. The MSDS for Airosol Aircraft Insecticide lists butyl gloves, chemical splash goggles and SCBA (self contained breathing apparatus) as protection measures, and says "Prevent all skin contact. To prevent from getting on clothing, operator may use rubber apron." However, airline personnel and passengers are not issued any of this protective equipment when this product is used on aircraft.

Stephen Johnson, EPA's director of pesticide registration, was quoted in the New York Times as acknowledging that exposure to d-phenothrin could create medical problems for people with allergies, chemical sensitivites, asthma and other respiratory problems.

Human nervous systems work in very similar ways to those of insects, and insecticides like d-phenothrin that work by disrupting insect nervous systems also have the potential to disrupt the nervous systems of humans. (World Health Organization. 1990.) Nervous system poisoning may affect behavior, learning ability, vision, motor control, reflexes, speech, respiration, and more. Furthermore, d-phenothrin is one of a type of synthetic pyrethroids whose mode of action closely resemble that of DDT in the peripheral nervous system of animals. These pyrethroids are thought to bind to the same membrane receptors that DDT does, causing similar deleterious nervous system effects. [Ironically, the Association of Flight Attendants sued the U.S. Department of Agriculture (USDA) in 1977 over their requirement that planes be sprayed with DDT. The suit was dropped when USDA agreed to allow d-phenothrin to be used instead. Now researchers are learning that d-phenothrin and other synthetic pyrethroids share some common modes of action with DDT.]

Chronic Health Effects of Synthetic Pyrethroid Pesticides

Recent research has also linked DDT and synthetic pyrethroids (along with numerous other chemicals and pesticides) with the potential to bind to, or otherwise interfere with, sex hormone (e.g., androgen and estrogen) receptor sites in humans and wildlife. Such compounds are known as endocrine disruptors. Laboratory experiments have demonstrated that exposure of fetuses to endocrine-disrupting chemicals can profoundly and permanently disturb organ differentiation (e.g., in females, the development of mammary glands, fallopian tubes, uterus, cervix, vagina; and in males, the development of the prostate, seminal vesicles, and testes). In both sexes, the external genitalia, brain, skeleton, thyroid, liver, kidney and immune system are also targets for steroid hormone action and are thus potential targets for endocrine-disrupting chemicals. The deleterious effects of endocrine-disrupting chemicals on the reproductive success of many wildlife populations (including mammals, birds, fish, and turtles) have been documented. (Colborn, et al, 1993.)

Unfortunately, human health effects of endocrine-disrupting chemicals are not as easily studied. Exposure to a d-phenothrin-containing delousing spray was suggested as one possible explanation for an unusually high incidence of male breast development among Haitian refugees in U.S detention centers in 1983. The androgen-binding (or anti-androgenic) properties of the pesticide were suggested as a causal mechanism to explain the symptoms noted. (Brody, et al. 1993.) In one study, all the pyrethroids tested (including d-phenothrin) inhibited androgen receptor binding. According to the authors, this suggests a mechanism by which chronic exposure of humans or animals to pesticides containing these compounds may result in disturbances in endocrine effects relating to androgen action. The authors conclude: "Until additional toxicological and endocrine studies can be conducted in vivo with the pyrethroids, it appears prudent to advise protection from any form of contact or ingestion of the pyrethroids in order to prevent any undesireable effects on the human reproductive system." (Eil and Nisula. 1990.)

More is known about some other endocrine-disrupting chemicals known or suspected to have deleterious effects on human health. These include the synthetic hormone DES, and the pesticide DDT. According to key researchers studying endocrine-disrupting chemicals, "It is now suspected that increases in the incidence of numerous pathologies in men and women may be related to exposure to pesticides and other endocrine-disrupting chemicals that can mimic DES and are thus estrogen agonists." The pathologies that they list are the increases in human breast and prostatic cancer, ectopic pregnancies, and undescended testicles, and decreases in human sperm count over the last 20 to 50 years. (Colborn, et al. 1993.)

Summary

Clearly there is much left to know and understand about the reproductive, developmental, and cancer-causing effects of pesticides and other toxic chemicals. But with the evidence that we now have suggesting that synthetic pyrethroids and similarly-acting compounds may be linked to these and other deleterious effects, it is unconscionable to deliberately expose humans to these pesticides without their prior informed consent.

What should Congress do about this situation?

1. The barbaric practice of spraying aircraft cabins while passengers are on board must be halted. The U.S should put pressure on the World Health Organization to withdraw its endorsement of this practice. Congress should bring pressure to bear on those countries that mandate such spraying, notifying them of U.S. Center for Disease Control's conclusions that such spraying is ineffective and potentially dangerous to passengers. This pressure could be in the form of withholding foreign aid or landing privileges to those countries or airlines that refuse to comply. Congress should also direct EPA to cancel the U.S. registrations of all products labelled for occupied airplane cabin use.

2. In the meantime, Congress should require that airline passengers purchasing tickets in the U.S. or flying out of U.S. airports be given *meaningful* advance notification if their flight will be sprayed. This should probably be verbal as well prominently-displayed written notice given at the time of ticket purchase, so that persons will have the option of not buying the ticket should they object to being sprayed. If this

notice is buried in small print on the back of the ticket, it will not be meaningful. If passengers are simultaneously told that the spraying is "safe," then they are not being accurately informed, and will not be able to give truly informed consent. EPA's own guidelines specify that pesticides should not be characterized as safe even when applied according to the product label, since they are designed to be biologically active and kill living organisms. Furthermore, pesticides are currently registered on a risk/benefit basis. This means that even if studies show that a pesticide poses risks to human or environmental health, it will still be registered if EPA determines that the "economic, social, or environmental" benefits of its use outweigh that risk. Registered pesticide products are definitely not "safe" for humans to breathe, and passengers should not be misled that they are.

Passengers and workers on U.S. airlines should also receive notification about other pesticide uses on aircraft, including pesticide fogging of cabins, "painting" of cargo holds with insecticides, etc. Workers, passengers and their luggage are exposed to the "residual activity" of these pesticides in the same way that insects are, and such residues could pose health risks to sensitive, immune-compromised, or allergic individuals, and others. Residual airborne and surface residues of pesticides only add to the already unhealthy environment in the oxygen-depleted, recirculated air in enclosed aircraft cabins. Steps should be taken to minimize pesticide use on aircraft, and air monitoring studies and other measures should be taken to determine and minimize passenger exposure to pesticide residues.

3. Congress should require meaningful protections and advance notice to U.S. airline employees who are required to use pesticides. Employees should be informed of the risks inherent in applying and inhaling pesticide sprays, the range of factors that influence individual susceptibilities, and the potential risks of chronic exposure. Workers should be issued and required to wear protective clothing, including respirators, to prevent exposure. We would think that OSHA and FAA regulations would already cover such employees, and do not know why airline employees are not presently wearing protective equipment when spraying pesticides in enclosed cabin spaces. Symptoms of dizziness, confusion, or "stupor" (listed acute exposure symptoms of Airosol Aircraft Insecticide) in pilots and flight attendants when the pesticide is used "30 minutes before landing" could obviously lead to disastrous consequences.

Thank you for your consideration of our comments.

Jennifer Shirley
2242 N.E. 18th Avenue
Portland, Oregon 97212

June 22, 1994

Mr. Jim Oberstar
Aviation Subcommittee
2251 Rayburn House Office Building
Washington,D.C. 20515

Dear Mr. Oberstar:

I have been a flight attendant with American Airlines for 17 years. Throughout most of my career, cigarette smoking was legal.

My colleagues and I work in a most unusual setting, under very unique circumstances. The pilots are under pressure by the airlines to reduce fuel consumption by limiting the air flow in the cabin which many times results in crew fatigue and headaches. The noise levels are high, the pressure changes cause problems for many crewmembers, the list continues. However difficult these environmental conditions may be for some, there is nothing worse than cigarette smoke.

I had my uniform burned by a cigarette, several times I had to recover lit cigarettes that people dropped between their seat and the fuselage, I woke passengers who had fallen asleep with a cigarette in their hand (too much to drink), many times I found cigarettes in ashtrays or the lavatory sink that were not completely extinguished, this list also continues.

The thought of a fire onboard an airplane is absolutely terrifying and, luckily, very rare. What is not rare is the threat of lung damage and cancer due to second-hand smoke. A flight attendant friend of mine died of lung cancer four years ago. She never smoked a day in her life. Her physician said it was most likely from second-hand smoke. Does flying have to bear such a high price?

I cannot tell you how miserable it can be to have to work in a smoke-filled cabin. I can only hold my breath so long. It has made such a difference in my health since the domestic smoking ban. No more burning eyes, coughing, and sneezing. I used to have to put my uniforms in a separate closet because they smelled so badly.

I can't urge you enough to fight for bill H.R. 4495. Airplanes might be a place where people come and sit for a few hours a couple times a year, but for us, it's our workplace and it needs to be as safe as it can be, for everyone. Thank you for your help.

Jennifer Shirley

Cash, Smith & Wages

May 16, 1994

Ms. Caroline Gabel
Subcommittee on Aviation
2251 Rayburn House Office Building
Washington, D.C. 20515

Re: Cabin Air Quality Hearing, May 18, 1994

Dear Caroline:

The following comments are submitted for the record on behalf of the 20,000 flight attendants represented by the Association of Professional Flight Attendants (APFA) at American Airlines. We commend the Subcommittee for taking up the vitally important issue of cabin air quality.

With the new generation of airplanes, flight attendants increasingly complain to APFA of air quality problems. Flight Attendants attribute many eye, nose, and throat irritations to poor air quality inflight and the ease of catching colds from being in the cabin with an infected passenger. Most of these are anecdotal stories, but to flight attendants this is commonly accepted as fact. Flight attendants live and experience these problems trip in and trip out.

The FAA has failed to meet its obligation to address the issue of poor cabin air quality. The National Academy of Sciences' report on Airliner Cabin Environment in 1986 made eight recommendations to improve cabin air. The FAA has not acted on one of them. Only one recommendation has been implemented -- the domestic smoking ban -- and that was by congressional legislative action. Flight attendants working on international flights are still forced to endure the hazards of working in a cabin filled with cigarette smoke.

FAA testimony during the hearings on July 29, 1993 before the Subcommittee on Technology, Environment and Aviation on Cabin Air

indicated that carriers incur a substantial savings by reducing the amount of outside air that is brought in the cabin. Healthy Buildings International has done a great deal of research on buildings and aircraft cabins. HBI information distributed at the International Flight Attendants Congress in 1989 shows a savings of 42 gallons per 1,050 miles on a DC-10 aircraft. That equals a fuel savings of 62,000 gallons per year per plane. HBI's conclusion is that reducing fresh cabin air intake by one half saves only 0.8% of fuel.

There is a particular incident pertinent to air quality that we would like included in the record. Although not usually mentioned as a component of air quality evaluation, comfortable cabin temperature is crucial aspect of the cabin environment. Temperature is so relevant to passenger comfort, it is not an issue thought to need regulation. Yet an ongoing situation at American Flagship/Eagle brings the issue into question. An incident occurred on July 10, 1993 where the cabin temperature exceeded 100 degrees as the airplane taxied out for take-off. The SD-360 aircraft had no air conditioning available on taxi while the passengers and crew were confined in the sweltering heat for 25 minutes before the captain returned to the gate. Passengers complained of nausea from the extreme heat. After complaining about being dizzy and having a hard time breathing, the only flight attendant on board fell unconscious. Paramedics were called to meet the flight at the gate. To further aggravate the situation, beverages were not available for the passengers. No drink service was scheduled for the flight and this aircraft type has no running water in the galley or lavatory. Hence, no beverage was available for passengers to take medication or for the flight attendant to provide a damp towel for those passengers who felt faint.

This is not the only incident of the air conditioning system's substandard performance. An FAA Aviation Safety Inspector was on board a similar flight with such extreme temperatures. The irony is that temperature standards exist for shipping animals but not for the passenger cabin. APFA< the union representing Flagship flight attendants, would appreciate the Subcommittee's assistance in addressing this matter.

APFA requests that the Subcommittee take action by: (1) encouraging the FAA to implement all of the National Academy of Sciences' recommendations including establishing an acceptable program for

systematic measurement of air borne particles, ventilation rates, radiation exposure and cabin pressures; (2) requesting that the FAA establish acceptable cabin temperature standards; and (3) reviewing the results of the air borne disease study now in progress at the Center for Disease Control.

Please feel free to contact me at 703/548-3676 with questions.

Sincerely,

Joan Wages

Joan B. Wages

**STATEMENT OF WALTER J. SHEA, PRESIDENT
TRANSPORTATION TRADES DEPARTMENT, AFL-CIO**

**BEFORE THE AVIATION SUBCOMMITTEE OF THE
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION**

U.S. HOUSE OF REPRESENTATIVES

AIRCRAFT CABIN AIR QUALITY

May 19, 1994

My name is Walter J. Shea. I am president of the Transportation Trades Department, AFL-CIO, whose 29 affiliated unions represent several million working men and women in the airline, automotive, rail, transit, trucking and related industries. Attached please find a list of TTD's affiliated labor organizations.

Transportation labor is pleased to have this opportunity to participate in the Subcommittee's deliberations over the serious issue of aircraft cabin air quality. TTD strongly supports and concurs with the views of the Association of Flight Attendants (AFA), whose president Dee Maki serves as a TTD vice president and member of our organization's highest governing policy body. The attached resolution, adopted by our 29 member executive committee, expresses transportation labor's support for action on this employee and passenger safety issue.

It is not generally known among passengers that less fresh air is now being circulated in cabins of newer airplanes which mix recirculated air with fresh air. Flight attendants, however, are acutely aware of the health risks this operating phenomenon poses both to passengers and flight attendant crews. Each and every day thousands of flight attendants enter their workplace with the knowledge that the air they will breathe throughout the day exposes them, their fellow crew members and passengers to myriad airborne health risks.

It is ironic that older planes were designed to provide 100 percent fresh air that was replaced every three minutes. Hence, the health and safety risks associated with recirculated air are a product of newer generation aircraft and present day operating practices.

These newer planes mix recirculated air and fresh air every seven minutes or more. Approximately 40 percent of aircraft now has recirculation systems. What does this mean to flight attendants and passengers?

First, it increases the exposure to airborne toxins, viruses and bacteria in the cabin. Second, it causes increased exposure to such health hazards as respiratory ailments. One can easily understand what could occur during the flu season. In fact, on one plane, 72 percent of the passengers were infected with a serious strain of influenza from one ill passenger while the plane was delayed at the gate.

Existing FAA regulations do not adequately address the issue of aircraft air quality, and unfortunately it is not being corrected voluntarily by the industry. For example,

current regulations provide only that *"each passenger and crew compartment must be ventilated"* and that the air *"must be free from harmful or hazardous concentrations of gases or vapors."* There are no explicit requirements for ventilation rates for passenger cabins.

In light of compelling evidence presented by the AFA to this Subcommittee and FAA's refusal to act on this issue, transportation labor urges you to enact legislation (H.R. 2985) that requires FAA to promulgate regulations establishing minimum standards for the amount of fresh air that must be present in the cabin.

We thank the Subcommittee for providing us an opportunity to express our views.

[For further information, contact TTD Executive Director Edward Wytkind at 202/628-9262.]

AIR QUALITY ON AIRCRAFT

WHEREAS, a 1986 report by the National Academy of Sciences made several recommendations on improving the air quality on aircraft including maximizing fresh airflow for occupants on fully loaded flights; and

WHEREAS, no government standard exists for air circulation on aircraft; and

WHEREAS, new aircraft provide only half fresh air and half recirculated air that is freshened every six or seven minutes as compared to most older aircraft that are filled entirely with fresh air; and

WHEREAS, reducing the amount of fresh air from outside the cabin increases the amount of airborne toxins, viruses and bacteria in the cabin; and

WHEREAS, airplane filters, which remove a high percentage of airborne particles, tend to get clogged if not changed often enough, and

WHEREAS, flight attendants who routinely work in cabins with poor air quality report of respiratory problems, viruses, headaches, nausea, fatigue and other health problems; therefore be it

RESOLVED: that transportation labor fights to protect the health of flight attendants and passengers against the potentially serious health implications of poor cabin air quality; and be it further

RESOLVED: that the Transportation Trades Department, AFL-CIO and its affiliated unions support the Association of Flight Attendants' legislative efforts for stricter government standards for cabin air quality aboard aircraft.

Resolution No. 18-93(s)
Submitted by: Dee Maki, AFA
(As adopted September 30, 1993)

TTD AFFILIATES

The following labor organizations are members of and represented by the TTD:

Air Line Pilots Association
Amalgamated Transit Union
American Federation of State, County and Municipal Employees
American Federation of Teachers
American Train Dispatchers Association
Association of Flight Attendants
Brotherhood of Locomotive Engineers
Brotherhood of Maintenance of Way Employes
Brotherhood of Railroad Signalmen
Communications Workers of America
Hotel Employees and Restaurant Employees Union
International Association of Fire Fighters
International Association of Machinists and Aerospace Workers
International Brotherhood of Boilermakers, Blacksmiths, Forgers and Helpers
International Brotherhood of Electrical Workers
International Brotherhood of Firemen and Oilers
International Brotherhood of Teamsters
International Longshoremen's and Warehousemen's Union
Int'l Union, United Automobile, Aerospace and Agricultural Implement Workers of America
International Union of Operating Engineers
National Marine Engineers Beneficial Association
Retail, Wholesale and Department Store Union
Service Employees International Union
Sheet Metal Workers International Association
TransportationCommunications International Union
Transport Workers Union of America
United Brotherhood of Carpenters and Joiners of America
United Steelworkers of America
United Transportation Union

January 21, 1994

TRANSPORTATION TRADES DEPARTMENT, AFL-CIO

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